Railway Engineering and Maintenance

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Railway Engineering and Maintenance

Formerly the Railway Maintenance Engineer

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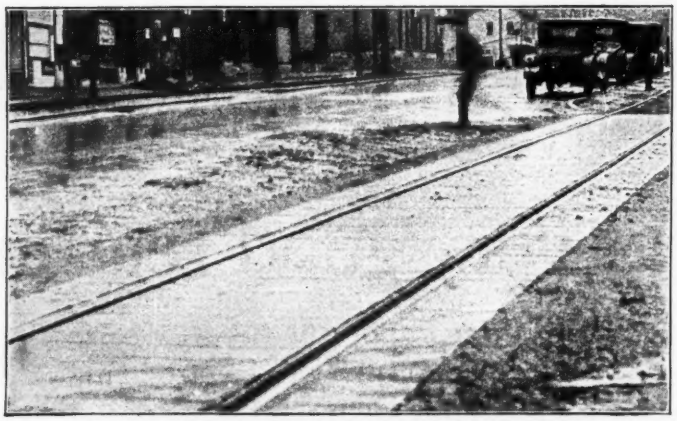

Carey Elastite Preformed Track Pavement insures a water-tight grade crossing.

They patched the crossing every month . . . *until Carey Elastite Preformed Track Pavement was installed*

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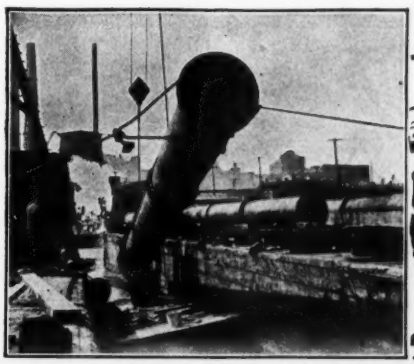
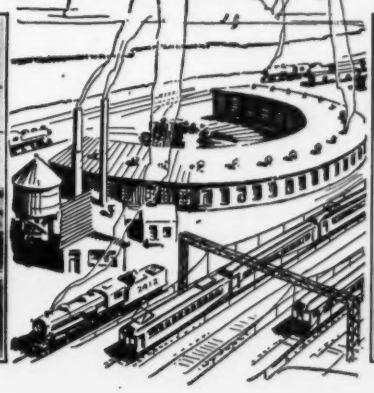
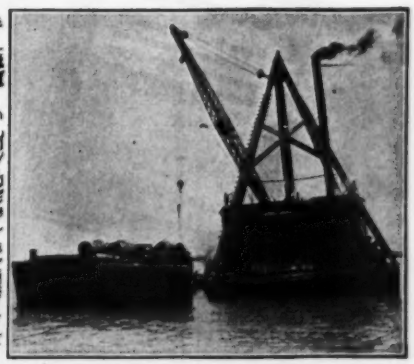


48-foot section being laid





The pipe-laying equipment

A NEW line to deep water in Lake Michigan, that presents many unusual elements of interest to the waterworks engineer, has recently been completed by the Illinois Central Railroad to supply their 27th Street Shops at Chicago.

This line extends from the intake well at the old shoreline to the new breakwater, a distance of 650 feet.

The section of the lake traversed will be filled in to become a part of Chicago's Park System.

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Showing the use of the flexible ball joint

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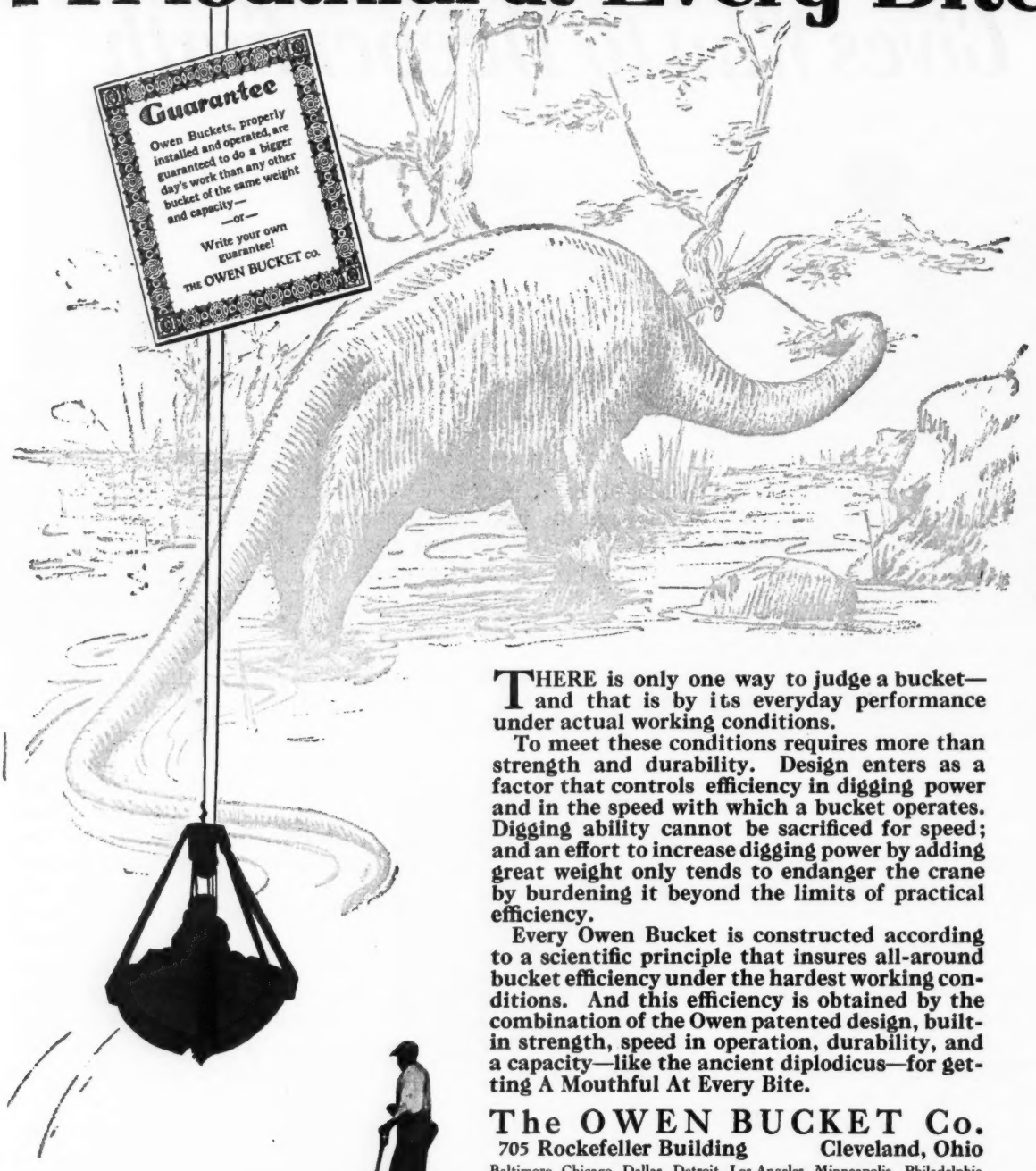

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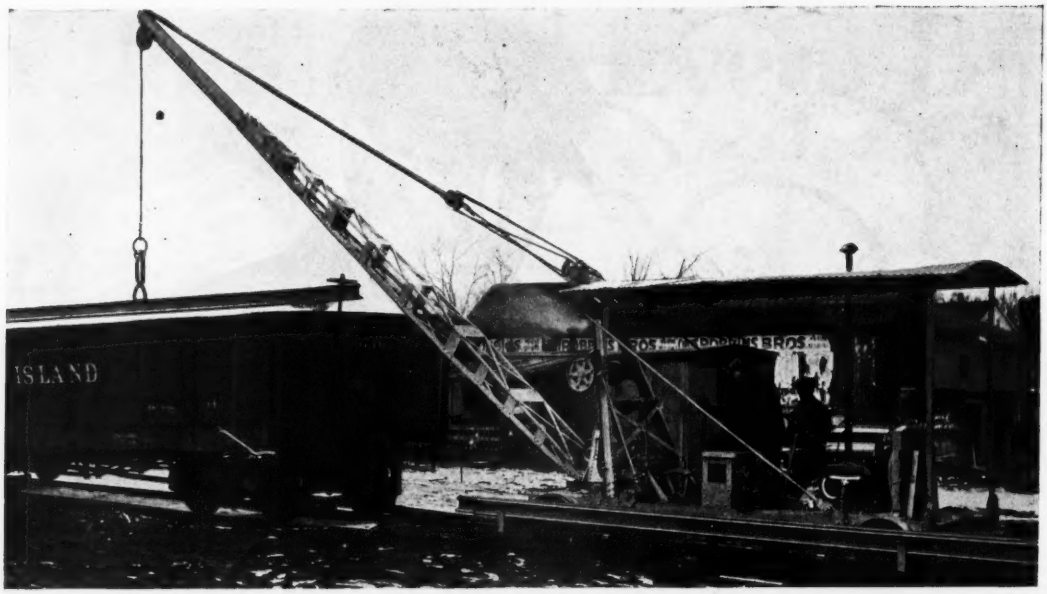

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Through greater range and power, Parsons Rail Cranes are helping many roads to make material savings in the cost of re-laying rail

ROADMASTERS and m. of w. engineers predicted it last winter. And cost records on track-laying jobs this spring and summer are proving it.

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Thorough investigation will prove the value of Parsons Rail Cranes for your track-laying. We will be glad to furnish you a list of railroad officials who are now using Rail Cranes. And write for Bulletin 26-C, giving detailed specifications.

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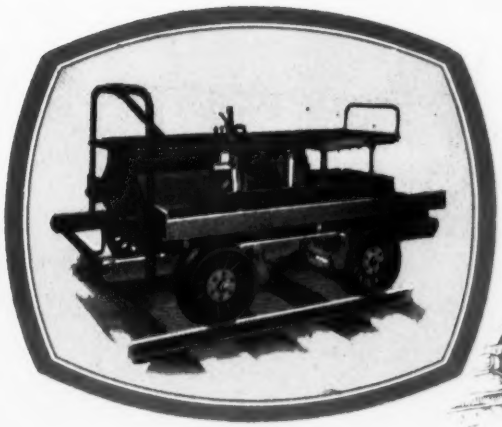
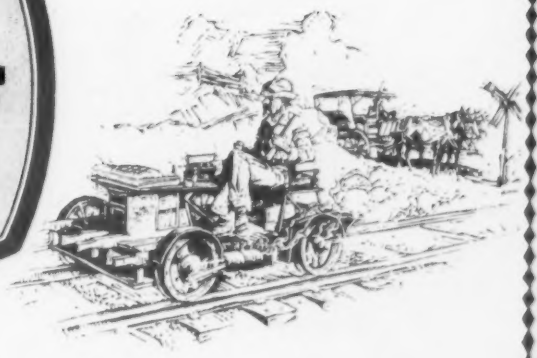
PARSONS RAIL CRANE





Revolutionizing the section car

First*

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* To use a water-cooled engine.
* To use an air-cooled engine.
* To use a gear drive.
* To use a chain drive.
* To use a two-cycle engine.
* To use a pressed steel frame.
* To use wood center wheels.
* To use a self-priming engine.
* To use pressed steel wheels.
* To build a really successful clutch drive.

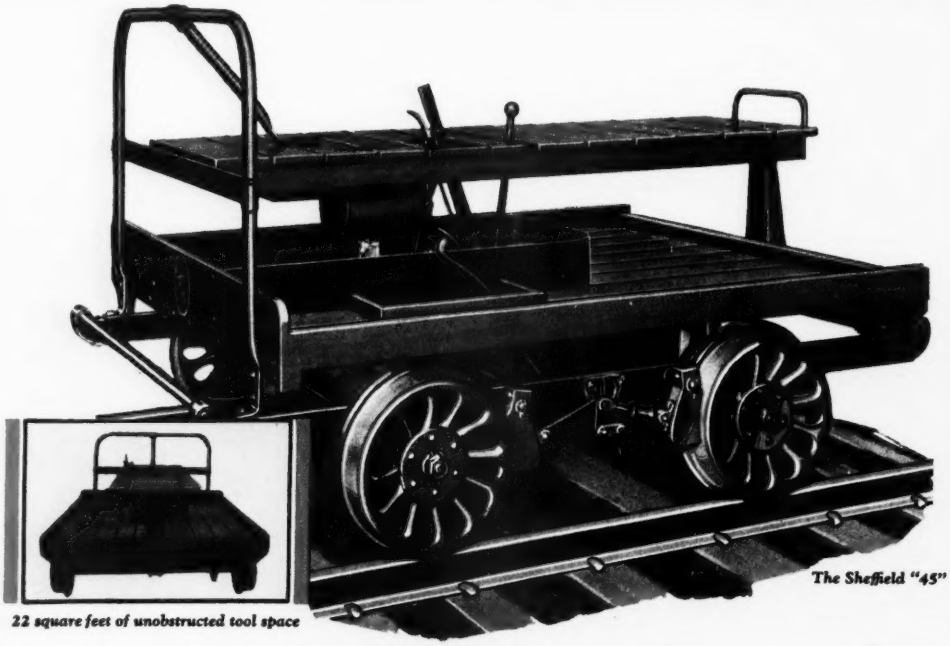
By taking advantage of over thirty years of experience in building motor cars and putting it into practice with traditional Fairbanks-Morse thoroughness, a new standard for section car construction has been conclusively established.

Features like the Ricardo cylinder head, three-point suspension, positive drives, and automobile-type pressed-steel frames, attest the progressiveness of F-M design. The ability of F-M cars to keep everlastingly at it is indisputable evidence of exalted manufacturing standards that refuse to compromise with quality, even in the most inconspicuous details.

(Typical refinements are described on the next page)

FAIRBANKS-MORSE
MOTOR CARS

First on the rails—and still first



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22 square feet of unobstructed tool space

Out in front in the light section car class

The "40-B"

Foremost in everything a fine section car should be. Known for its great power, its exceptional performance, and super-dependability.

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- **—Three-point suspension of engine.**
- **—Highly developed magneto which gives a hot spark at slow cranking speeds and thus insures easy starting automatic spark control.**
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- **—Greatly simplified friction transmission with countershaft mounted on S.K.F. self-aligning ball bearings.**
- **—Pressed steel auto-type frame.**
- **—Largest deck space ever provided on a section car—22 square feet of unobstructed tool space.**
- **—Body readily lifted off by simply removing four bolts.**

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FAIRBANKS-MORSE
MOTOR CARS

First on the rails—and still first

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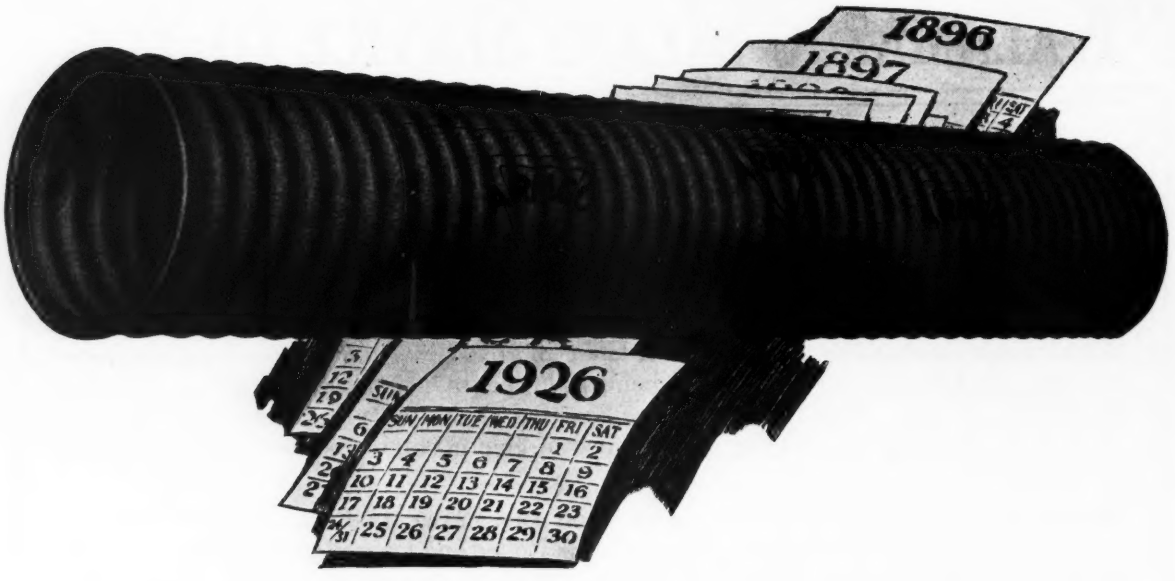

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THIS 30th Anniversary of the invention of the corrugated culvert is of deep significance to you as engineer or official responsible for the efficient and economic drainage of your road.

30 Years' Evidence

30 years have proved the soundness of the corrugated design for culvert construction. A culvert must endure unusual structural conditions. In most cases it is a structure literally "built upon sand". Uneven settlement, shifting and slippage of foundation result. In addition, swelling soils and freezing moisture create unusual pressures. 30 years' evidence proves that only the flexibility of the corrugated design can successfully resist these conditions.

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Many of the first corrugated culverts placed are still in service. Their long life is the result of the purity of the iron from which they were constructed. This purity has been preserved and improved throughout these years by Armco—today and for many years the only pure iron made. To check the endurance of Armco culverts a five year investigation — nation-wide — covering thousands of culverts of every type has been made. It proves conclusively (1) that only a flexible culvert can endure under field conditions—most culverts fail through fracture, (2) that pure Armco Iron is the answer to corrosion.

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In 30 years, much experience has been gained about culverts — location, capacity required, installation methods and problems of design. This accumulation of 30 years' experience is at your service. For further information write

ARMCO Ingot Iron

ARMCO CULVERT & FLUME MANUFACTURERS' ASSOCIATION
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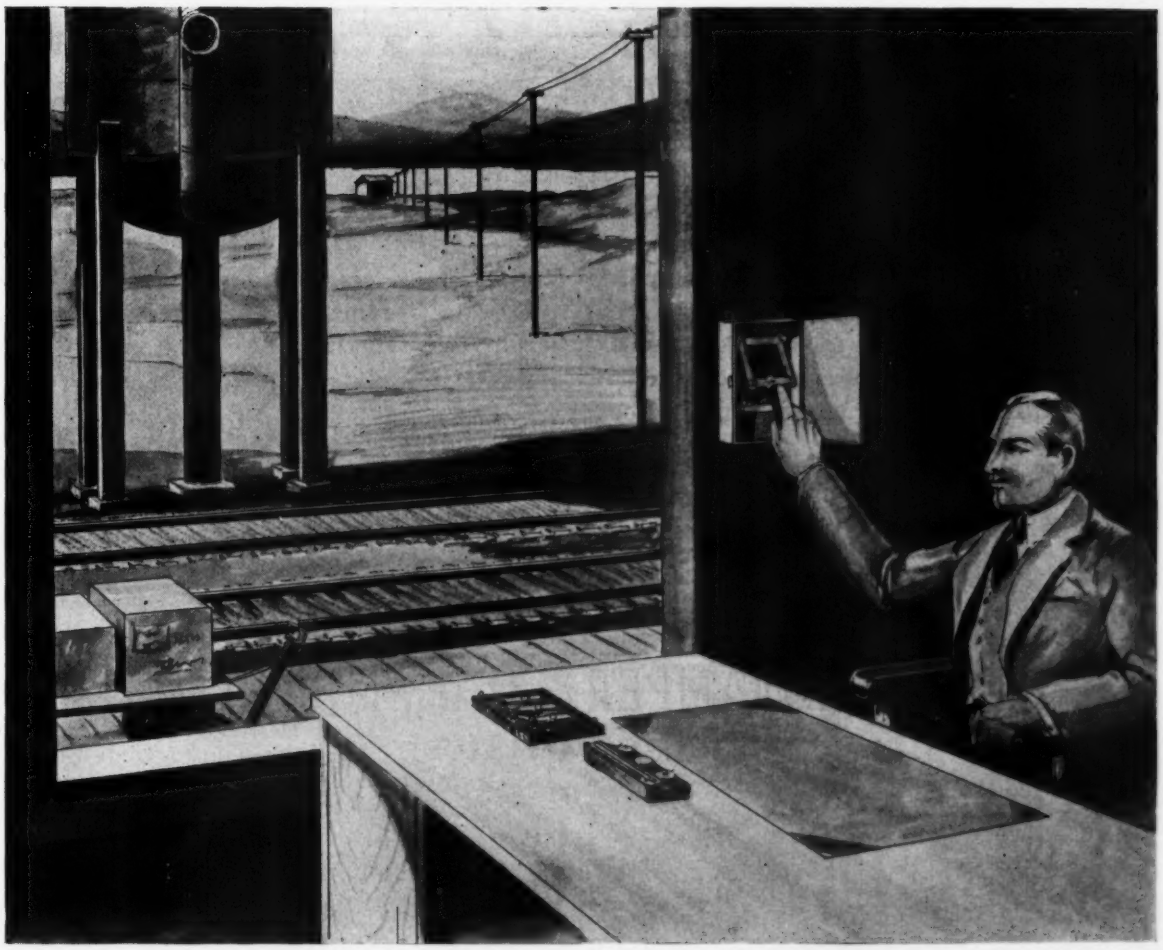
ARMCO CULVERTS

Consistent performance—because of consistent uniformity



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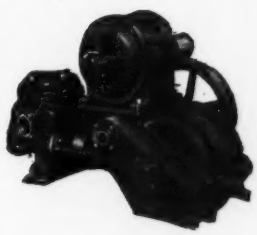
An electric switch at your elbow can start and stop the flow of water into the tank at will — and you can *forget* the pump house—leave it locked—29 days of the month.



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Ingersoll-Rand Portable Compressor
Size 3½x5. Operates four pneumatic tie tampers

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Railway Engineering and Maintenance

Volume 22 July, 1926 Number 7

AN INQUIRING ATTITUDE

A STRIKING example of the possibilities that still remain for the effecting of marked economies at one point or another on many roads by the correction of conditions of long standing is afforded by the revision of the drinking water supply system at the Havelock, Neb., shops of the Chicago, Burlington & Quincy, described on a following page. Here a relatively simple rearrangement of the facilities which was made at an expenditure of $3,893 resulted in an immediate annual saving of $5,900. In other words, this revision paid for itself in eight months.

While possibilities for improvements of such marked character may not be common they are more common than is generally realized. The first and most important essential in the detection of such possibilities is an inquiring attitude on the part of the maintenance officer—an unwillingness to accept conditions as necessary because of the fact that they have "always been so." In other words, to use a newspaper expression a "nose for news" is highly valuable in locating waste. Once the waste is located the correction is usually relatively simple. The difficult step is to detect the expensive practices that already exist. A maintenance officer should be constantly on the alert to detect opportunities of this character.

LET THE FOREMAN JUDGE FOR HIMSELF

ONE difficulty which confronts the track foreman in meeting his responsibility for good surface is that he has only one means of judging of the results —his eye. Unfortunately this is not always enough. Track may *look* as if it were in good surface and still not ride well. Because of this, the roadmaster sometimes finds it hard to convince a particular foreman that track surface on his section is not satisfactory or to make him understand that certain stretches of track are not in as good condition as the rest of the section.

A certain roadmaster reports that he has found that he can overcome this difficulty by having these obstinate foremen ride over their sections on locomotives. "I find," he says, "that enginemen are glad to co-operate in this as they don't like the rough spots any better than I do. I can usually arrange to have the foreman's permit timed so that he will get his ride with a man who 'rolls 'em' pretty hard and usually one trip is enough; the foreman will learn a lot of things about his track that he didn't know before." A second trip after the foreman has had a chance to correct the defects in his track will give him an object lesson in the supervisor's judgment of track conditions. Where train schedules permit, this practice is one that could well be followed more generally than is now the case.

MORE SUB-DRAINAGE NECESSARY

WITH THE advent of heavier power, greater speed and increased traffic, it is becoming apparent on many roads that what was at one time adequately drained stable track is gradually giving way to subsidence, causing water pockets, soft spots and a track structure which is maintained in good condition only by excessive maintenance. A striking example of this condition is afforded on the St. Louis division of the Illinois Central where an extensive installation of sub-drainage has been found to be the only practical means of restoring many sections of wet track which a number of years ago were kept sufficiently dry and stable by the maintenance of surface ditches. That similar conditions have developed on other sections of this road and are capable of solution by the installation of sub-drainage, is evident by the plan to continue and extend this work.

The large amount of sub-drainage already installed on the Illinois Central, as described elsewhere in this issue, is interesting not only because of the conditions developed and the scope of the work, but also because the use of vitrified and porous tile pipe has been combined at a large initial saving over the cost of all vitrified pipe drains, with apparently satisfactory results from every standpoint.

That future increases in track loadings will have an important bearing on the extent and character of drainage is evidenced by the conditions described in the article referred to, which puts the further responsibility upon the roadway department of being at all times well informed and able to cope with the situation in the most economical manner when the occasion arises.

"TIME IS OF THE ESSENCE OF THE CONTRACT"

WHEN THE main track of a busy railroad must be cut for any purpose the officer in charge of the preparation for the work is confronted by two outstanding requirements: that the time the track is out of service and also the cost be kept at a minimum which will permit the successful accomplishment of the desired end, recalling the definition of an engineer as "one who can do with one dollar what any d—d fool can do with two." The dictionary, in more refined language, describes an engineer as "one who carries through any scheme or enterprise

by skill or artful contrivance," but after all there is little real difference in the two definitions, each of which emphasizes the importance of careful planning to assure efficiency and economy.

The description of the conversion of a fixed truss span on the Chicago & Eastern Illinois into a temporary lift span to permit the passage of a dredge, as described elsewhere in this issue, is a case in point, and is interesting not only in the method by which the problem was attacked but also in the short time the track was open and in the small amount of material that was consumed, since the greater part of the timber could be salvaged with small loss.

Any work involving the cutting of a main track is complicated by the necessity of maintaining traffic while preparations are being made, hence the successful handling of such projects calls for ingenuity, careful study and a well-planned program to meet the three essentials of railroad operation—safety, speed and cost. The men in charge of the maintenance of American railroads have an enviable record in such feats and there is no evidence that they are retrogressing in this respect.

WHERE HASTE MAKES WASTE

THE CLASS I railways of the United States spent $106,578,796 for cross, switch and bridge ties last year or more than $250 per mile of track maintained, according to data compiled by the Bureau of Railway Economics. In view of the magnitude of this expenditure one might reasonably expect that it was surrounded with every precaution to insure the maximum return therefrom. Yet in a report presented at the annual meeting of the Purchase and Stores section of the American Railway Association at Atlantic City last month and abstracted elsewhere in this issue, the Forest Products committee reported that "the extent to which emergency purchases continue to be made causes the committee to again stress the fact that forest products can be purchased economically only when demands are made known sufficiently in advance of needs to permit of orderly procurement and distribution." As a remedy, the committee suggested that a program be prepared at least 12 months in advance of use.

Of late much emphasis has been placed on the curtailment of stocks to the minimum and engineering and stores officers alike have been endeavoring to hold on hand only the materials required for immediate necessities. As a result many roads have gone too far and have been forced to rush into the market hurriedly to meet unexpected demands. The campaign to reduce stocks has been of great benefit to the railways. It has cleared up many situations which were a severe drain on the roads. However, now that this lesson has been learned and surplus stocks have been quite thoroughly eliminated, it is proper that precautions should be taken to avoid the danger of carrying this reduction too far. The problem is to develop an orderly program of buying which shall avoid over stocks, but which shall at the same time insure that materials are on hand when needed, and enable them to be bought at a fair price.

The determination of the demands for ties rests primarily with the engineering department and it is the responsibility of engineering officers to determine their requirements sufficiently in advance to enable the ties to be bought to the best advantage and to be seasoned and treated most efficiently. The benefits of such a policy are many. In addition to enabling the purchasing department to buy the ties at the most economical period, orderly buying insures better timber, more careful and accurate inspection and greater care throughout all steps in the handling, all of which affects to no small degree the aggregate service life.

THE WAY TO BETTER CONCRETE

THE EXPLANATIONS which are forthcoming after the discovery of a poor piece of concrete work now rarely refer to or even hint at "bad cement," although this was once the ever-ready answer for such a contingency. There are two reasons for this, (1) much greater uniformity in the quality of cement, and (2) a greater knowledge of concrete. The knowledge that has come through longer experience with concrete has demonstrated that the explanation of defective results is not as simple as was once generally supposed. We know that defective results may be brought about by any one of many possible objectionable conditions such as improper proportioning, inadequate mixing, soft or dirty aggregates, an excess of mixing water, evaporation of the mixing water, freezing, etc. Any or all of these conditions are subject to variations with the location of the work, the sources of the materials and the personal equation.

In the early days of the present century, cement manufacture in this country was new. There were wide variations in standards of quality and sufficiently frequent instances of poor quality to make "bad cement" a plausible explanation of many concrete failures. But due to the united efforts of the manufacturers and users, standard specifications were drawn up and adopted which now probably enjoy more general acceptance on the part of all concerned than any other material specifications.

This has led to a standardization of practice in manufacture that has largely eliminated cement as a variable influence in the quality of concrete, with the result that for a number of years attention has been centered on the refinement of practices designed to reduce the number of failures chargeable to the other possible causes enumerated above. Thus we have heard much concerning excessive quantities of mixing water but almost nothing concerning cement as a factor in failures.

However, the last two or three years have witnessed a change in sentiment which is again directing attention on the cement as a factor in the quality of concrete but from a somewhat different angle than in years gone by. Users of cement are not inquiring whether the cement now used is of good quality, but whether or not it could be made better. They are wondering whether the requirements of the specifications should be raised, a question which has been answered in part by the recent action of Committee C-1 of the American Society for Testing Materials in submitting tentative specifications for cement which increase the requirements as to the tensile strength.

There has also been a feeling that one standard of Portland cement does not necessarily fulfill the requirements of all types of construction, leading, for example, to the suggestion that something other than the standard Portland cement might perhaps serve the purpose better for concrete immersed in sea water. The last two years have also seen the introduction of a quick-hardening cement which develops a strength in 24 hours approximating that of standard Portland cement concrete in 28 days.

Another development which is exciting interest is the introduction of materials which, when added to

the cement produce rather pronounced effects on the behavior of the mixture. A more common property of such ingredients is a fattening effect, as the result of which the concrete has an increased workability. This property has a marked influence in encouraging the use of smaller amounts of mixing water. Of still more significance is the accelerating effect of certain compounds such as calcium chloride. This material, when used in properly designed admixtures which eliminate certain objectionable properties, and in accordance with specific limitations as to quantity, will result in a more rapid strengthening of the concrete.

All of these developments are indicative of the more or less general movement for better concrete. Whether this will find its greatest advance in better methods of workmanship, or primarily in better cement, or largely in the intelligent use of carefully perfected admixtures, it is now impossible to say, but it behooves the officers in charge of concrete construction to keep in touch with current developments and avail themselves of opportunities for improvement in the quality of the concrete constructed under their direction.

HAVE YOUR OWN OPINION

IN THE course of discussions at conventions of railway supervisory officers, it is not uncommon to hear someone object to a new idea on the ground that it is contrary to prevailing rules established by the railway managements. Still more common is the custom of offering as discussion of any subject a statement of current practices on a particular road rather than an opinion backed up by sound reasoning and a thorough study of personal observations.

The attitude of mind which prompts a man to accept the dictates of his superiors without question is not to be judged too harshly. It is one mark of the sterling loyalty of a faithful employee, and while the management of no railroad has any thought of developing an organization based on military discipline, the very foundation of successful management is the faithful, if not implicit execution of expressed or implied instructions. However, the fact that a man must carry out instructions does not deny him the right to question their correctness and if mature consideration leads him to think that they are wrong, it is his duty to express his opinion and outline his reasons for it when suitable opportunity affords.

Such opportunities are offered by the conventions of such organizations as the Roadmasters' and the Bridge and Building associations. In fact, unless the members of these associations do not give critical thought to the correctness of present methods and policies and express themselves freely when they have reason to think that such methods and policies should be changed, they are limiting the usefulness of the associations.

This does not mean that the associations as a whole or their members individually should be tactless in their remarks. There are matters such as those which concern the relations of the railroads to regulatory authorities concerning which expressions of opinion should of necessity emanate solely from authorized representatives of the managements, but with these exceptions the subjects which come up for consideration at conventions should be given a free and frank discussion prompted by a single objective, that of discovering improved methods and practices of conducting railway transportation.

New Books

Proceedings of the American Wood Preservers' Association for 1926. 338 pages. Bound in cloth. Illustrated. Published by the American Wood Preservers' Association. E. J. Stocking, 111 West Washington street, Chicago, secretary.

This volume comprises the complete report of the convention of the American Wood Preservers' Association held at Cleveland, Ohio, on January 26 to 28, 1926, and embraces reports of committees and personal papers relating to the scientific, commercial and industrial aspects of the timber treating industry. They represent the work of the railroad men and representatives of the wood preservation industry as well as men engaged in scientific research in this field.

Owing to the fact that the railroads are the primary users of treated wood, the presentation of data and the discussion of problems arising from the use of treated wood on the railroads are given a prominent place in the proceedings. One of the most valuable features of the proceedings from the standpoint of the railroad man is a report on the average tie renewals per mile on representative railroads in the United States. Other noteworthy material relates to piling, posts, poles, etc. In addition to the matter relating to the proceedings of the convention, the volume contains 42 pages of statistics on the treatment of timber and the preservatives used in the United States in 1924, prepared by R. K. Helphenstine, Jr.

Proceedings of the American Railway Bridge and Building Association. Edited by C. A. Lichty, general inspector, purchasing department, Chicago & Northwestern, Chicago. 280 pages, illustrated, 6x9 in. Bound in cloth and paper. Published by the Association, 319 N. Waller Ave., Chicago.

This volume contains the proceedings of the thirty-fifth annual convention which was held at Buffalo on October 20-22, 1925, a report of which appeared in the November issue of Railway Engineering and Maintenance. At this convention reports were prepared on the reduction of accidents to employees, precast concrete units, the relative merits of metal and wooden sash, methods of handling minor jobs of maintenance work and electrically-operated water stations.

In addition to these, papers were presented on the Treatment of Water for Locomotive Use by R. C. Bardwell, superintendent water supply, Chesapeake & Ohio, Richmond, Va., and on the Construction of the Michigan Central Bridge over the Niagara River at Niagara Falls by H. Ibsen, special bridge engineer, Michigan Central. These proceedings also contain addresses by F. M. Barker, division superintendent, Lehigh Valley, Buffalo; R. E. Woodruff, division superintendent, Erie, Buffalo; on the Use of Concrete on the Lackawanna, by George J. Ray, chief engineer, Delaware, Lackawanna & Western, Hoboken, N. J., and on the Work of the Bridge and Building Department, by Frank H. Alfred, president of the Pere Marquette. These proceedings contain a large amount of information of interest and value to railway maintenance officers. Attention may be called particularly to the committee on the reduction of accidents to employees, which presents a thorough analysis of the character of accidents incurred most frequently in bridge and building service and outlines the precautions that may be taken to reduce their frequency.

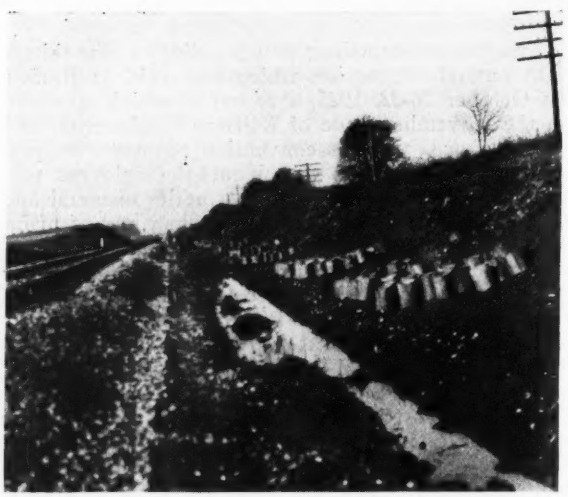
Illinois Central Installs Large Mileage of Track Drainage

Combination Vitrified Pipe and Field Tile Drain Proves Efficient and Economical

By P. T. SAVAGE
Engineering Department, Illinois Central, Carbondale, Ill.

FOR a long time certain sections of track on the St. Louis division of the Illinois Central have given constant trouble to maintenance forces owing to improper drainage of the sub-grade, which has permitted the formation of soft spots and water pockets in the road bed. This condition, which has long been known to exist, has been so aggravated in recent years by increased traffic and the increased weight of locomotives and speed of trains, that almost daily surfacing of certain sections has been necessary in an attempt to provide the first class track conditions which are ordinarily maintained on this division. This situation brought about a study of the existing conditions and a thorough investigation as to the best methods of curing the many soft spots.

Tile laid 15 or 20 years ago in cuts on the Centralia district may have been laid deep enough at the time, but owing to subsidence and the passing of heavier locomotives with increased impact due to greater speed, the tile was pushed outward and upward until it became useless. In this condition much of the tile was torn out by ditching machines where it had reached the surface and some of it, scarcely



Recurring Bulges Were Evident in Many of the Wet Side Ditches

below the surface, was crushed in by the weight of the ditcher bucket. The remaining tile was dug out, cleaned and used for repairs and cross drains.

In investigating the causes of the wet spots over the division, cross sections of the sub-grade were taken and it was found that the ballast section had subsided under the rails and had formed pockets or troughs were water was held due to the impervious nature of the sub-soil. These pockets, which in some places were found to extend to a depth of eight feet below the top of the rail, developed into soft spots and it became almost impossible to hold the track to line and good surface without constant work.

Three possible solutions suggested themselves in the problem presented; dig out the soft mud and replace it with good dirt, drive piling, or lay tile. It was decided to drive short piling along about 8,000 lin. ft. of the worst sections of the track for temporary relief and then lay tile parallel with the track below the line of the water pockets. The pil-

In Many Instances the Tile Was Laid 8 Ft. Below the Top of Rail

ing was recommended to provide an immediate check to the unstable conditions at the worst places and the tile later to remove the deep seated cause of the trouble, the pockets of water in the sub-grade. Piles were driven at the rate of about 100 a day, at an average cost of $1.25 per track foot.

While best practice dictated the use of vitrified pipe instead of common drain tile in the drainage system because of the exposure and pressure to which the tile is subjected, it was thought expedient to lay common drain tile lines with 20 ft. of vitrified pipe at the outlets, owing to the increased cost of approximately 15 cents a foot for the vitrified pipe. By laying only enough vitrified pipe at the outlets to protect the farm tile from alternate freezing and thawing, and against other common forms of disintegration due to exposure to the elements, it was found that at the saving of about 15 cents per foot, a total saving of approximately $10,500 was effected during the season of 1925 in adopting the combined vitrified and farm tile drains. As this sum was 80 per cent of the amount expended for labor, it was thought to be an item worth considering. The tile laid during 1924 was placed at a total average cost of 60 cents a foot, which was much higher than had

been estimated, due to encountering rock in the cuts. However, the results obtained were so favorable that it led to carrying on the work on a larger scale during the summer of 1925.

In planning the drainage, a detailed survey of all soft spots was made. Natural drainage was first inspected for a good outlet which would not be submerged during high water, for it was recognized that with a poor outlet an otherwise good tile drain will not function properly. Test holes were dug in all of the worst places to determine the depth of the water pockets and in most cases, water would rise in the holes to within one foot of the surface. Elevations of the bottom of these holes were noted, along with the elevations of the top of rail and the open ditch. The profiles of these points were plotted and the tile drain grade line was then carefully established so as to be below the bottom of all of the pockets. The minimum grade was set at 0.2 ft. in 100 ft., although near Matthews, Ill., it was found necessary to use a 0.1 fall.

The drainage work carried on during 1925 was actually started on July 18. Grade stakes were set to the nearest 0.01 ft., 8½ ft. from the center line of the track. String targets were erected across the ditch for three stations down grade and by sighting across a grade rod and the string targets the bottom of the trench was graded. Where 10-in. tile was laid, the bottom of the ditch was shaped with a round pointed tile shovel while for smaller tile a round bottomed hoe, called a crumming hoe, was used. In many cases it was necessary to drill and blast rock which cropped out in the ditch and then tamp clay into the hole in order to make an even bed. The tile was then laid, care being taken to cover all openings of over ¼ in. with bats. The dead or upstream end of each tile line was packed with broken tile and rocks to prevent dirt from washing in. The tile were then inspected and covered with straw, one bale being used to every 100 ft. of tile. This was done to form a mat or filter around the tile to prevent dirt and fine cinders from entering the joints, which were left open, it being believed that although the tile was called porous drain tile, very little if any water would ever percolate through the tile itself.

Field Tile Not Used Between or Under the Tracks

The main lines of tile were laid 10 ft. from the center line of the track and care was exercised to have long smooth curves where turns were necessary in order to prevent choking. Cross drains or laterals that tapped into the water pockets under the track were installed about 50 ft. apart in the soft spots in order to afford a quicker outlet than the natural percolation as the clay was found to be almost impervious. Whenever it was found necessary to lay tile between the tracks vitrified pipe was always used, as it was found that common drain tile would not stand the crushing pressure to which it was subjected. Crossings under the track were laid with vitrified elbows and either a section of old engine boiler flue or cast iron pipe. In some instances old bridge timbers that had been laid parallel with the track under the ballast in the soft spots were pushed up and out into the ditch by squeezes. Most of this wood was in a good state of preservation and gave considerable trouble as it was necessary to cut through it in order to place the tile at grade.

The first illustration shows a typical soft spot on the northbound main near Anna, Ill., were "push outs" may be seen bulging up in the open ditch. The water standing at this point is seepage from pockets and springs under the track. In this location it was found necessary to install 6,400 ft. of 8-in. tile and to place the tile 8 ft. below the top of the rail. One month after installation, water was still flowing two inches deep in this drain.

Surface Ditches Are Trimmed After Installation

After the straw was spread over the tile, the ditch was backfilled with engine cinders instead of the clay which was originally removed, in order to give the water better access to the tile. Head walls were then built of stone at the outlets of the drains to prevent weathering and clogging, and hardware cloth or wire mesh was used to cover the openings in order to keep small animals from entering the tile. After the tile drains were installed and the backfilling completed, a Jordan ditcher was used to shape up the surface ditch, care being taken to have the outlet of the surface ditch separated from the tile outlet in order to prevent erosion and washing out of the tile. In many cases before work was begun by the tile crew, an American ditcher was run through the cut to remove the top layer of soil and widen the cut so that the tile layers would have a place to throw the dirt from the trenches without danger of a cave-in or slide.

The last illustration shows a reverse curve near Texas Junction, Ill., as it appeared three months after 8-in. tile had been installed on both sides of the track,

A Formerly Wet Section of Track Three Months After Drainage Was Installed

and the surface ditch trimmed with a Jordan ditcher. The sub-grade at this place is of a sandy composition and is filled with innumerable springs which necessitated the laying of only a few feet of tile at a time because of cave-ins and slides caused by the water-soaked condition of the sub-grade. A recent survey of this drainage installation, which was completed early in 1925, indicates that a considerable sum per year in track labor expense will be avoided on this piece of track which is one-half mile long.

The fact that water pockets occur in fills as well as in cuts must not be overlooked. In some places blind rock or French drains were installed. Trenches about four feet wide were dug, starting from the

natural ground line at both sides of the fill and working up to and under the ends of the ties, or until the edge of the pocket was reached. These trenches were filled with rip rap, one man size, from the Bedford quarries of Indiana. It is recognized that this type of drain is not permanent, for eventually enough fine clay will form in the voids between the rocks to clog the outlet and stop the flow, but it is effective for immediate and temporary relief.

During the summer and fall of 1925 a total of 70,000 lin. ft. of tile was laid at an average cost of $0.198 per lin. ft. for contract labor. This cost includes laying of the tile and backfilling with cinders, installing cross drains, the cost of straw and the necessary reforming of the open ditch. It does not include the price of the tile, unloading, freight or engineering supervision.

The work of installing the track drainage was carried on under the general supervision of L. H. Bond, engineer maintenance of way of the Illinois Central, and under the direct supervision of G. M. O'Rourke, roadmaster on the St. Louis division. The actual work was done by the W. J. Zitterell Company, Webster City, Iowa.

Change in Pipe Layout Cuts Cost of Drinking Water

AN ILLUSTRATION of what may be accomplished not only in reducing expenses but also in obtaining more satisfactory conditions by improvements based upon a study of existing facilities, is shown in the remodeling of the drinking water supply system of the large car repair shops of the Chicago, Burlington & Quincy at Havelock, Neb., where from 1,500 to 2,000 men are employed. In making these changes an annual saving of $5,900 was effected by an expenditure of $3,895.

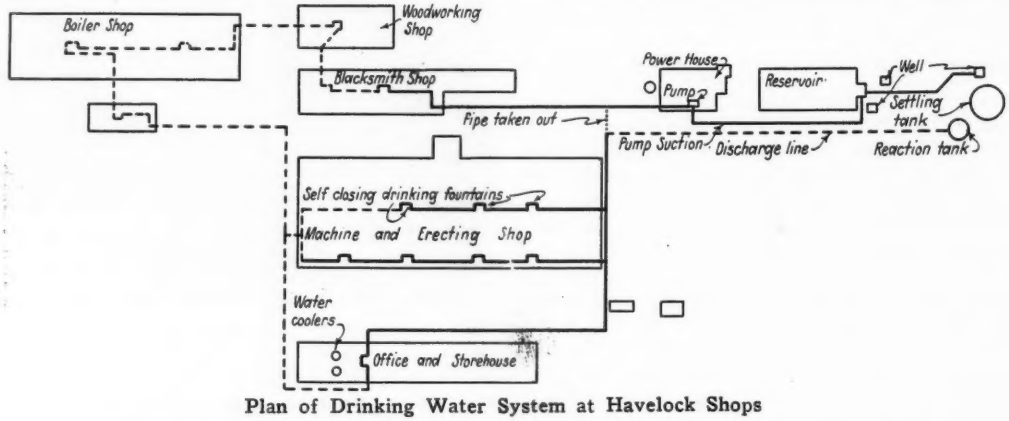
The drinking water supply is drawn from wells and discharged into a collecting basin from which it is distributed through the shops by a pump located in the power house. Prior to the remodeling of the system the pipes were not insulated and in some places where they were underground they were laid alongside of or crossed steam and hot water pipes, while in the buildings they were exposed to the warm air of the shops. Several of the supply lines also had dead ends which precluded the circulation of the water.

The water was delivered through 13 bubbling fountains, each with a coil running through a cooling box in which ice was placed. While it was the intention that the bubbling fountains should be kept closed except when used for drinking purposes, they were allowed to flow most of the time due to the fact that if the water was kept standing in the pipes it did not taste fresh, and also became too cold for the men to drink. This practice involved a considerable waste of both water and ice and required the pump to supply about 16,000 gal. of water daily or an average of from 8 to 10 gal. daily for each employee. The annual consumption of ice was 980 tons, of which amount it was necessary to ship 730 tons from Lincoln, 5 miles west, as the ice house at the shops had a capacity of only 250 tons. The labor cost of handling the ice and distributing it to the cooling boxes was $11 per day.

In planning the system it was decided to use the existing facilities, except the ice boxes, wherever possible, and to connect up the dead ends so as to provide a continuous flow of water by discharging the far end of the line into a tank 25 ft. high located at the water treating plant. Besides assuring full circulation, this arrangement saved the water that was formerly wasted and also provided sufficient head to insure a continuous supply of water to the fountains if it becomes necessary to shut down the pump at any time. A total length of 650 ft. of 3-in. pipe, 666 ft. of 2-in. pipe and 525 ft. of 1-in. pipe was installed underground, while 1,270 ft. of 2-in. pipe and 70 ft. of 1-in. pipe were used above ground, galvanized pipe being used for the underground lines and black pipe for those above the surface. A total length of 2,715 ft. of pipe was also insulated.

Arrangements were made so that refrigerating coils could be installed if desired, through which to pass the water after it left the pump, but this was found to be unnecessary, as a study disclosed that the most desirable temperature of drinking water for men engaged in shop work was from 53 to 55 deg., which was the temperature at which it came from the wells. Tests made after the work was completed showed that the water passed the last drinking fountain at a temperature of 58 deg. The shopmen appreciate the improvement that has been made and there has been no tendency to leave the fountains open after drinking.

The results have been so satisfactory that similar installations are being made at other points. The system was designed and installed under the direction of F. T. Darrow, assistant chief engineer, and J. R. Hickox, hydraulic engineer, respectively, of the Chicago, Burlington & Quincy.



Plan of Drinking Water System at Havelock Shops

All Arrangement Made, the Bridge Was Raised in Four Minutes

Chicago & Eastern Illinois Raises Bridge by a Novel Method

Existing 103-ft. Steel Span Is Lifted Vertically 23½ ft. by Locomotive Power to Permit Dredging Operations

By J. E. BERNHARDT
Bridge Engineer, Chicago & Eastern Illinois, Chicago

THE PASSING of a large floating dredge engaged in excavating a drainage ditch across the right-of-way of the Chicago & Eastern Illinois gave rise to an ingenious method of raising an existing railway bridge span to permit the movement of the dredge. The method employed consisted of erecting a framed gantry at each end of the bridge and converting the span into a temporary vertical lift bridge by means of blocks, cable and locomotive power. The entire work in connection with this project was done in less than five days, while the actual time consumed in bringing the locomotives to the site, breaking the track, raising and lowering the bridge and again opening the track to service, consumed only 58 min. All of this work was done without a mishap and without delay to traffic.

The dredging operations were taking place in Busseron creek which crosses the Chicago-Evansville, Ind., line of the Chicago & Eastern Illinois about four miles south of Sullivan, Ind. The track at this point is carried across the creek by a 103-ft. single track, pin-connected truss span on stone masonry piers with pile trestle approaches at each end. The truss span is 35 years old and weighs about 100 tons. The horizontal clearance of the bridge is such that the dredge could operate easily but the vertical clearance required for the dredge is 22 ft. greater than that which existed beneath the truss span.

This line handles all of the Chicago & Eastern Illinois passenger traffic to Florida, New Orleans and other southern points as well as a large amount of perishable freight business to and from the south together with a heavy coal movement from western Kentucky. As the traffic is dense it was essential that a method of removing the steel span be devised which would be safe and at the same time permit the immediate resumption of railroad traffic at any time. With this in view, it was decided to convert the fixed steel truss span temporarily into a vertical lift bridge.

Timber towers were erected on the piers at each end of the span. The vertical posts of the towers were of 12-in. by 12-in. timber 44 ft. long. Each tower was made up of four of these timbers, two on each side of the track with a 12-in. by 12-in. cap across the tops of each pair of posts parallel with the track. Spanning across the tracks on top of these caps were two pairs of 8-in. by 16-in. stringers which extended beyond the 12-in. by 12-in. posts a sufficient amount to provide for adequate sway bracing. These stringers served as the supports for the upper blocks of the hoisting rig.

The towers were braced laterally by stiff inclined legs resting on the masonry and bolted to the vertical posts at the bottom and to the stringers at the top. Adequate sway or line bracing connected the inclined legs and the vertical posts. The entire tower was then provided with rigid portal bracing of 5-in. by 10-in. car stringers. The towers were braced longitudinally with two inclined timbers bolted to the posts at the top and to piling in the trestle approach at the bottom. The towers were also braced longitudinally with cables on each side of the track. Each cable was anchored securely to piling at the end of the pile trestle approach, then carried to and wrapped around the stringers at the top of the nearest tower, thence across the stream, wrapped around the stringers of the tower on the opposite pier, and then extended down to the piling in the trestle approach on that end and securely anchored. Eight-inch by 16-in. braces were run from the bottom

of the bents to the nearest pile bent to take the pull from the snatch blocks which were attached to the bottoms of the main posts. The timber in the towers was all framed on the ground and each bent with its inclined braces and bracing was bolted up complete. The bents were then set in position and the stringers placed upon them by a 35-ton locomotive crane.

To insure safety, all connections between the steel span and the towers were pin connections. Loops made of old eye-bar material were looped around the end pins of the truss, small notches being burned out of the cover plates of the end posts to provide clearance for the loops. The open ends of the loops were drilled for 3¼-in. pins which went through the heavy forged shackles of the lower tandem blocks. The upper blocks were suspended by special shackles from locomotive axles which were placed across the tops of the overhead stringers. The blocks were reaved with 10 parts of ⅝-in. cable, the load line running from the top block to a snatch block at the bottom of the bent.

The work of erecting the towers was started on a Wednesday morning and at 3 p. m. Saturday, everything was ready and a trial lift made so that connections for attaching the load lines to locomotives could be made in such a way as to have the two corners of one end of the truss remain at the same relative elevations as they occupied on the bridge seat.

The power used to raise the bridge consisted of two

Each Gantry Was Sturdily Framed and Well Braced

consolidation engines. At 6 a. m. Sunday, just four days after work was started, the two load lines at each end of the bridge were connected to each locomotive and the span lifted clear of the bearings. The track rails had previously been well sanded to prevent slipping of the locomotive drivers. Everything being found satisfactory, the two enginemen were given the signal to go ahead at a predetermined speed and the bridge was raised 23½ ft. vertically without a stop. The span was held in the elevated position by the locomotives and when the dredge had dug its way through the opening and clear of the span, the span was lowered to its original location, the track connected and traffic restored.

The advantage of this method was the degree of safety with which it could be employed and the fact that railroad traffic could be promptly restored in case the dredging operations took more time than had been estimated. It would have been an easy matter to back up the dredge, lower the span, permit the operation of trains and again raise the span. It required only 58

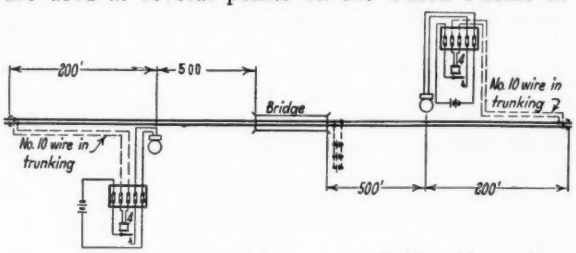
The Raised Bridge Provided Ample Clearance for the Dredge

min. to get the work engines to the site, sand the track, make the hitches, disconnect the track, raise and lower the span 23½ ft., connect the track and permit a train to pass. If it had been necessary to lift the span a second time, the time consumed in the operation would have been much less.

The timber in connection with this work was framed by company forces, while the Kelly-Atkinson Construction Company, Chicago, had charge of and performed the other work. The entire project was under the supervision and direction of the writer.

Automatic Alarm Bells for Bridges with Close Clearance

AUTOMATIC bells, similar to the regular highway crossing bells located 500 ft. from bridges, are used at several points on the Union Pacific as



Track Plan and Circuit Diagram for Bridge Alarms in Non-Automatic Territory

a means of warning brakemen that they are approaching a through bridge of limited side clearance. A considerable number of the older truss bridges on this road offer less than the standard clearance now

provided in new bridges. Rather than make expenditures to widen all the bridges at one time, the automatic warning bells have been installed to warn trainmen, who may be hanging out looking for hot journals or for other reasons.

A bell is located 500 ft. from each end of the bridge and the track circuit control is so arranged that the bell starts ringing when the locomotive of a train passes a point 700 ft. from the bridge. The bell continues to ring until the rear of the train passes the bridge. Standard signaling equipment is used for the bell installation.

How Can We Increase the Economies in Maintenance Work?

THE FORUM is a feature of the monthly meetings of the Kansas City Southern Maintenance of Way Association and is intended as a department where the many problems that arise in the maintenance of way department may be brought up for discussion by the men to whom they are of vital interest. The following are abstracts from papers on the subject of effecting economies in maintenance work which were presented at a recent meeting of the association at Texarkana, Tex.

A Program for Economy

By J. H. Cannon
Section Foreman, Wilton, Ark.

First: We must take care of the material we have, use it where it will be of value and apply it in a systematic manner so as to secure the best results. For instance, in driving spikes, they should be driven perpendicularly so that their full strength may be utilized in holding the rail.

Second: Angle bars should be kept tight to the rail and the rail tight to the ties, thus protecting these articles from undue wear. When rails begin to turn over they should be straightened up as they cut into the ties much faster if canted over.

Third: Scrap is a total loss unless it is picked up and saved. A place should be provided for each kind of scrap. If a foreman has too much scrap on his section to bring in on his hand car, he should go over his entire section with a push car and bring it in. After the scrap is all picked up he should see that all scrap is brought in daily.

Fourth: Material should be charged out properly. Much material is used and never charged out, with the result that it is carried as stock on hand until the inventory is taken, when it is often necessary to reduce the force to make up the shortage.

Fifth: Be honest with your company and with your fellow men.

Plan the Work and Exercise Care in the Use of Material

By F. N. Griffith
Section Foreman, Mooringsport, La.

Economy should have a place in our minds at all times. I don't believe we can economize any more than we do in our labor force unless we organize our forces a little better and line up our work so that we will know just where our work for each day will start. Having some system to our work will result in quite a saving in labor. Good tools also play an important part in doing a day's work with a saving of labor. With our supply cars running once a month, we can keep all tools in good condition.

While we might effect quite a saving by getting our forces well organized and equipped with good tools, I believe we can economize more in the use of material, for all material costs money, and we should be very careful to use only what we really need. Tie renewals will soon take place and we could save a few treated ties by not removing ties that will last another year. If we release rail from main line we should use that rail in some track where it will give just as good service as a first-class rail. Don't scrap any material that can be used.

Do Less Tinkering and More Constructive Work

By John Cooper
Section Foreman, DeRidder, La.

We must know our conditions, study them, and try to remedy the cause of our troubles in a permanent way. Eliminate doing work over as much as possible. Do less tinkering and more constructive work and know just what you will require to do the work with. Eliminate running around over the section. Use two days a week to get the soft places and have a system whereby you can always use the remainder of your time.

One of the fundamental points in economy is to do first-class work when working to standard plans, and when spotting track cover the entire section. If you can not get it in one day use two days, then go back to your regular work. Be prompt in getting away from the tool house and keep your men lined to their work. Regular men are a great factor in economy. I would rather have three well-fed men than six who did not have enough to eat because they did not work regularly.

What Economy Means and How It May Be Achieved

By M. C. Harwell
Section Foreman, Rodessa, La.

Economizing means to manage with care in expenditures. Therefore, it is necessary that we manage each portion of our work in such a manner that each job can be done in the shortest time possible, have each man assigned to the work he is best fitted for and so arranged that one man will not have to wait on another. Don't fail to see that each job is done right, as there is no economy in work not well done.

In ordering and handling material, we can effect quite a saving by ordering only such tools and material as are actually required at the time ordered, and by properly using and taking care of the material after it is delivered. It is also important that we load and unload material into and from cars promptly when they are placed, as this will speed up the movement of the cars.

All second-hand material should be piled and properly classified when released, in order to be ready

to load out to best advantage when called on to make shipment. We have found from the price list furnished us the value of scrap material, which shows the importance of keeping it cleaned up. I am sure we will all look after this closer since we find the value of these small items considerably more than we thought.

Keeping up with the job is good ecenomy. It is easier to keep up than to catch up, and when we find something that needs to be done, do it today, don't wait until tomorrow. You will have just as much to do tomorrow as you have today. I believe that we should have better and faster cars to shorten the time consumed in going to and from work, preferably motor cars. This would effect a big saving in time and would be economy in the end. I also believe that if we were allowed to hold the force we now have throughout the entire year we could do much work that we could not do with less force, and could maintain our track in better condition, thereby protecting rail and ties, as well as the equipment that passes over them, prolonging the life of all.

Train the Men Properly

By R. M. Murphy
Section Foreman, Shreveport, La.

A foreman's first duty is to employ the best labor available and assign them the duties that they are most capable of doing. Train them to perform this duty in the quickest, best, and safest manner. See that they do a day's work for a day's pay. Impress upon them the necessity of economy in labor and material.

Do not release material until it has served its purpose. Do not use new materials if there is second-hand on hand that will answer the same purpose. Do not let material remain in service after it has become dangerously worn or defective, as sooner or later this will result in an accident that often costs many times the amount it would have to replace same. Foremen must be on the alert at all times as our rolling stock is getting heavier year by year. We must observe our work closer and improve our methods in maintenance. The foreman should plan his work so he will be able to do the work easier, quicker and cheaper.

Avoid Injuring Material by Careless Methods of Work

By W. W. Arnold
Section Foreman, Zwolle, La.

I believe we can economize more by the proper use and care of material. We are now nearing the season when tie renewals begin, and ties should be handled as carefully as possible to avoid bruising which will cause decay. Old spikes should be kept gathered up and piled by the man pulling spikes, and carefully sorted so that when spiking new ties all old spikes serviceable for use may be re-driven. About half of the old spikes can be used again. I think the new spikes should be driven outside the rail and the old spikes inside the rail. Be careful not to hit spikes so hard that the last blow will break off the head. By this method I think we can save a considerable number of spikes that would otherwise be thrown into the scrap pile.

I also believe we can save many pairs of angle bars by guarding against setting track jacks in joints when smoothing track. I believe in setting the jack either ahead or behind the joint because if the jack is set directly in the joint it will in most cases cause too much strain in the center of the angle bars and perhaps crack them on the top edge, which will mean the cost of a new pair of bars and the labor to make the change.

Train and Educate Good Men*

By A. C. Farrow
Section Foreman, St. Louis Southwestern, Malden, Mo.

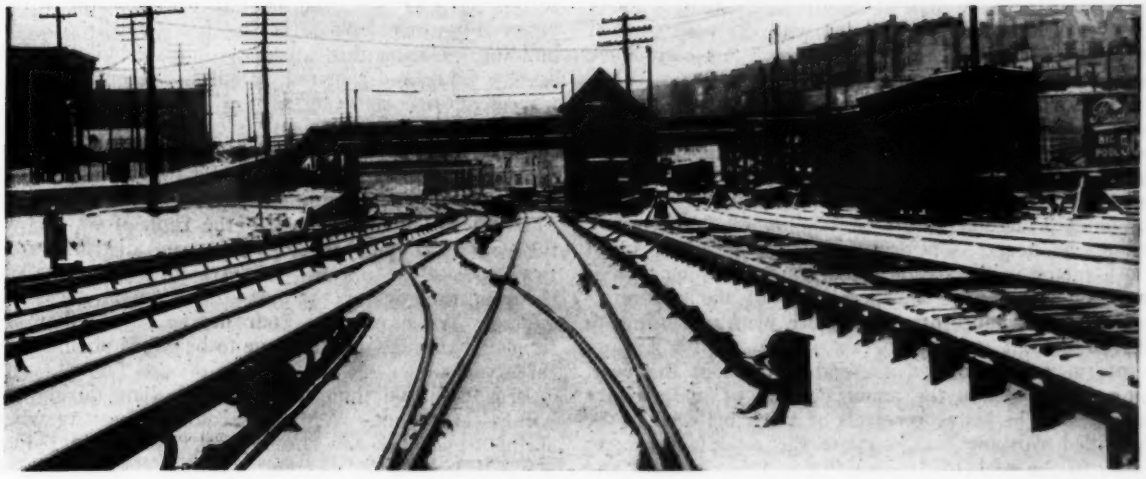
IN ORDER to train and educate good men, one must first present reasons that will cause them to see the need of training and education and that will awaken in them a keen desire for the benefits thus to be derived, for until they have felt the need of development it is impossible to obtain the best results. It is sometimes quite a problem to create this realization of the need for intellectual broadening, but the foreman should take advantage of every opportunity to lead his men to see for themselves that an employee who is educated, not only in the broader sense of the word, but more particularly in the field which enables him to do his work more efficiently, has attained something worth while.

One must feel that education is a standard for distinguishing people and measuring their value in the world, and that it is an asset which wealth cannot buy or take away. When once the desire for knowledge has found its way into a man's very existence, he will see that he can cultivate his desire to the fullest extent and, in return, he has a feeling of satisfaction which enables him to make advances in his work which otherwise would be impossible. A man who really longs for knowledge learns all he possibly can about his work and soon finds that his opinions are valued and respected, and his work is no longer a drudge but rather a pleasure, in that he is really part of the system, capable of thinking clearly for himself and capable of advancing his own interests as well as those of his employer.

The foreman, in conversation with his men, may be able to strike the chord which appeals most to them and thus draw them out to talk of the solution of their daily problems. The foreman must be considerate and understanding in his relationship with his men; he must be able to set the right example for them, causing them to see that there is a difference between educated and non-educated men and that knowledge can be obtained only by long, patient study and untiring efforts.

When the foreman has awakened the desire for knowledge in his men, then the task of correct and efficient training is no longer such a problem, for with education comes ability to think clearly and sanely, and thus to realize that there is only one way to do one's work, and that way is the most efficient way to obtain the best results. The foreman may show them that in their work, as in all business, the qualities of perseverence, efficiency, patience and courtesy are the absolute essentials to success. In order to train his men in the best way possible, the foreman will study them and his problems, decide on the best course to pursue, and then never let any other plan take the place of his selected course at any time, for every time he allows an exception to occur and thus divert them from the most efficient course, he is ruining the formation of good habits in his men.

*Abstract from a paper presented at the fifth annual meeting of the Sanitary Engineering and Maintenance of Way Departments of the St. Louis Southwestern at Paragould, Ark., on April 16, 1926.



Is it Practicable to Increase Amount of Winter Work?

Further Contributions to the Contest on the Advantages of Carrying on Maintenance Work During the Entire Year

THE advantages accruing from an all-the-year-round program for work for maintenance forces and the results obtained where such programs have been adopted, were presented by numerous contributors to the contest on the practicability of increasing the amount of winter work. The prize winning and three of the other papers received in the contest were presented in the June issue of *Railway Engineering and Maintenance*. Many of the other papers contain valuable information on this important subject and in order that they may be available to our readers we present abstracts of a number of these additional papers received in this contest, it having been necessary to condense them owing to the large number received.

Winter Work Reduces the Labor Turnover

By J. D. KEILEY

Supervisor Maintenance of Way, Chesapeake & Ohio, Russell, Ky.

Investigation and study of modern industrial plants show clearly and decisively that the labor turnover is one of the most costly elements in production. This is as true in maintenance work as in any manufacturing plant, but has not received the same intensive study. Corrective measures can readily be made to reduce this cost in the performance of maintenance work, where the labor turnover is excessively high, since employment in the maintenance of way department is cyclical and is caused by the mistaken idea that maintenance work can be accomplished only during certain seasons of the year. The wear and the breaking down of the track structure from a certain set standard of quality is accruing continuously the year around. To maintain it to a uniform standard, taking no other conditions into consideration, it is necessary to perform a uniform amount of work the year around.

The fact that maintenance labor is cyclical or seasonal with large summer forces and small winter forces, is the most critical and costly element entering into railroad track maintenance. Under the present conditions, after the organization of the force there is bound to be a selective process of elimination of the inefficient men from the gang which goes on for various lengths of time, depending on the locality and the ability of the labor market to supply experienced men. Roughly speaking, it takes from 30 to 90 days to get the gang organized so that the work may be performed with any degree of efficiency. During the period of organization and training of the men the labor turnover is extremely high and the actual accomplishment of work is very low.

An important factor which tends to high costs is that of congestion of work train movements, as the greatest volume of revenue traffic on many railroads is handled when the maintenance season is in full swing. This causes many costly delays to work train movements, as well as to revenue business. The maximum efficiency cannot be obtained due to the fact that they do not get the close supervision which would be possible if the work was distributed equally throughout the year. At times of revenue car shortages, which occur during the maintenance season, equipment is tied up under load with maintenance material, resulting in a loss of revenue for the railroad company and hasty, improper or uneconomical unloading of the maintenance material.

Seasonal employment is unsound economically. The man who can expect uninterrupted yearly employment, with a reasonable, regular income, is an asset to the community in which he lives. Regular employment

usually attracts the man of steady habits, who in many cases will work for less money with the assurance of steady employment. He usually owns his own home and raises his family in a fairly correct way. When he loses employment, or employment is not fairly regular, there is a certain amount of worry on his part as to when he will be laid off, which causes a certain indifference to his work, which impairs his efficiency as a producer; his purchasing power is stopped and he becomes a credit hazard for the merchants through whom he deals. Uniform maintenance forces would be a factor in the national problem of helping to balance or stabilize the business cycle of the nation.

The performance of maintenance work, according to an established yearly program, would permit a more uniform application of material throughout the year, thus affecting also the manufacturers of maintenance supplies. The heavy renewals of track material in the so-called working season cause the manufacturers to work at the peak of production for a few months and then shut down or reduce their forces, producing much the same condition in the labor field of the railway supply industry as in the maintenance of way department. The regular application and consumption of track supplies would be an economic advantage to the manufacturing structure of the country.

Some Results Obtained by Winter Work

By William Meier
Supervisor of Track, Pere Marquette, Grand Lodge, Mich.

We have attempted to do some of our maintenance work during the winter months, in order to give more time to the program of the summer's work. In October, 1923, we started to receive 78 track miles of new rail, to be laid by a contractor. About the 20th of October two rail gangs were started. The work went along until winter set in and we began to have bad weather, and during this time the gangs only worked on favorable days. The loading of the old rail was carried on concurrently with the laying of the new. The rail was inspected before loading and the rail that was good for re-sawing was shipped to a plant on our lines, re-sawed and used on one of the other divisions, which enabled that division to get its rail laying out of the way in a seasonable time of the year.

As to quality, the work compared favorably with rail laid during the summer. Care was taken to see that the rail was laid with the proper expansion, and rail anchors were applied to hold the expansion. The cost of laying the rail exceeded that which would be laid in the summer. Due to the extra clothing worn during the winter months, the men are unable to accomplish as much as they would in warmer weather. During the inclement weather the gang dropped to about 70 lin. ft. per man, while under favorable weather conditions they averaged around 100 ft. One factor was in our favor, since we started to lay the rail at the time of the year when the track was in good surface and line and had been put in good condition for the winter, so that the rail was not subject to any surface kinks. Section men followed up closely to shim any low ties. We completed the laying of the 78 track miles the last of May, 1924, and the laying of the new rail was out of the way in advance of the summer's work.

Much can be accomplished in little jobs in maintenance work during the winter with the regular winter section forces. We program our work for the whole year. First, we look after the fence repair and rebuilding. During this winter we have rebuilt 6 miles of new fence and repaired 30 miles. Second, rail displacements are made by section forces on sidings on their respective sections, by assembling three or four section crews. During the past winter we have relaid six track miles with heavier rails on passing tracks and other important sidings. Third, in the month of March we tighten bolts, burn the right-of-way, clean the station grounds and yard tracks and distribute new ties opposite the old ties that are to come out. We check up the gage on the curves, and do the necessary gaging. We have some four degree curves that are tie plated throughout, but have to be gaged about every three years.

It is the little things that can be done during the winter that count. With these out of the way when spring comes, we can speed up the work and reduce the peak load in the summer.

Elimination of Heaving Track Permits Rail Laying in Winter

By G. W. Morrow
Formerly Track Supervisor, New York, New Haven & Hartford, New Haven, Conn.

More attention has been given to drainage problems during the past decade or more, thereby reducing materially the heaving of track and the placing of heavy frost blocks to counteract its effects. On account of greatly reducing the amount of shimmed track the work of renewing rail can now be done during the winter season, making a reasonable allowance for snow storms, but a budget cannot be figured too closely on the rail program, as weather conditions will hamper and delay the work. On most roads the after-effects of snow storms will clear up enough to continue rail renewals.

The installation or renewal of tie plates, where necessary, is being done during the winter season, when it can be done just as well and just as economically as in the summer season and the regular winter work of regaging track can be taken care of at the same time.

The ordinary renewals of rail, frogs and switches in yards will be done in winter, as the rail is available from main line tracks, thereby relieving the summer program of this task and leaving more time for other essential work which cannot be done in winter.

Changing Conditions Demand New Methods

By J. W. Griffith
Roadmaster, Kansas City Southern, Pittsburg, Kan.

The idea of doing most of our heavy work in the spring and summer has been handed down to us from the railroads of the past when most of our track was maintained on dirt where it was disastrous to disturb the track except in the spring and fall when the dirt was sufficiently damp to insure packing well after being worked. I would still advocate the same ideas under the same conditions, but we have gotten away from this. We now have a stronger roadbed, because it has to carry a much heavier load than in former years, so most of the track now has some kind of ballast which will work just as well in winter as in summer if there is no frost in the roadbed. Two of our heaviest jobs, laying rail and making tie renewals, should be done in

the winter, since they can be done then as well as they can in the summer, leaving ample time to do the work that cannot be done during the winter.

We can always get the best of labor during the winter, as the farmers give good inducements to laborers during the spring and summer months and this leaves the railroads with mostly culls. The laborers are full of "pep" during the cold weather and will do at least 20 per cent more work than they will in the heat of the summer.

I have given my ideas with the section gang mostly in mind, allowing him to do more of his heaviest work in the winter to insure that he does not have any unfinished work left over at the end of the summer. Much of his work cannot be done until the right season of the year, but this will insure that he will be ready when the time comes.

Rail Laying Can Be Done as Economically in the Winter

By John Clark
Supervisor, Baltimore & Ohio, Walkerton, Ind.

Last winter we renewed 26 miles of track with new 100-lb. rail, using a work train with a rail loader to take the rail from the cars and put it in the track; after the track was laid we went over the territory and picked up the old rail. The district in which this work was done is all double-track with an average of 40 trains in 24 hours, but with all delays of clearing the track for the trains we can average one mile of track per day (8 hours) with a force of 80 men.

We installed 15 miles of new fence last winter, dug 1½ miles of new ditch and cleaned 3 miles of old ditch, and also put in tie plates on all the new rail that was laid last year. We gage our track and tighten up all bolts in the winter so that when it comes time to renew old ties the men have their work in shape to put in new ties to the best advantage. I find that the men can work much better in cold weather than in hot and accomplish much more in the winter.

It is very easy to get all the men necessary as there is not much work around small towns in the winter and men are available, while in the summer about the time the gang is organized the men quit and go into some factory. If allowed the men and new rail is furnished, I can accomplish much more in the winter than in the summer and have the track in good shape to take care of the work which cannot be done in the winter.

The Value of Stabilized Forces

By C. G. Grove
Supervisor of Track, Pennsylvania, Warren, Pa.

The tendency during the last 10 years on many northern railroads has been to do more maintenance of way work during the winter months than previously. This has been brought about largely because there has been closer supervision, a general curtailment in expenses and consequently fewer men allotted for the same amount of work, making it necessary to schedule the work more carefully.

With the new order of things it has been found that with careful forethought certain work can be executed in the winter in an economical manner. Stretches of track can be carefully surfaced and lined in warm weather and rail laid on them in the winter without injury to the latter because of poor line or surface. Ditching by machine can be carried on without interruption and in some protected places by hand where the snow is not too deep. The building and repairing of right-of-way fences lends itself readily to cold weather, especially when steel posts are used. General renewal of broken splices and some bolt tightening can be carried on, while the renewal and repair of cross drains can be better accomplished in the winter than in the summer. Cross ties and switch timber can be distributed in the winter for installation in the summer.

It is true, however, that practically none of this work can be carried on during the winter as economically as during the summer but the accomplishment of the items referred to in the winter permits us to keep a constant force at all times, giving us men of experience whose morale is far above the men who fear that they will be laid off during cold weather. A man sure of a job throughout the year will render much better daily service than one who fears a lay-off. Although the various items of winter work may cost more during cold weather, in the long run the use of our forces in the winter as outlined is really economical and practicable.

Careful Planning Will Aid

By P. Quinlivan
Roadmaster, Delaware, Lackawanna & Western, Buffalo, N. Y.

"Reduce forces, reduce expenses, shovel snow, keep up the tracks and prepare and lay out your work for the coming summer." This is the season's greeting to every maintenance officer as the winter approaches. While maintenance is greatly hampered in winter by snow conditions, still, by careful and systematic planning much of the preliminary work of maintenance can be done with very good results. Laying rail in the winter time may not show any appreciable saving in actual dollars and cents on the balance sheet but the adzing and spiking by old and seasoned men means longer life to the ties and better gage and line, a result which one rarely obtains with new and green men in the spring.

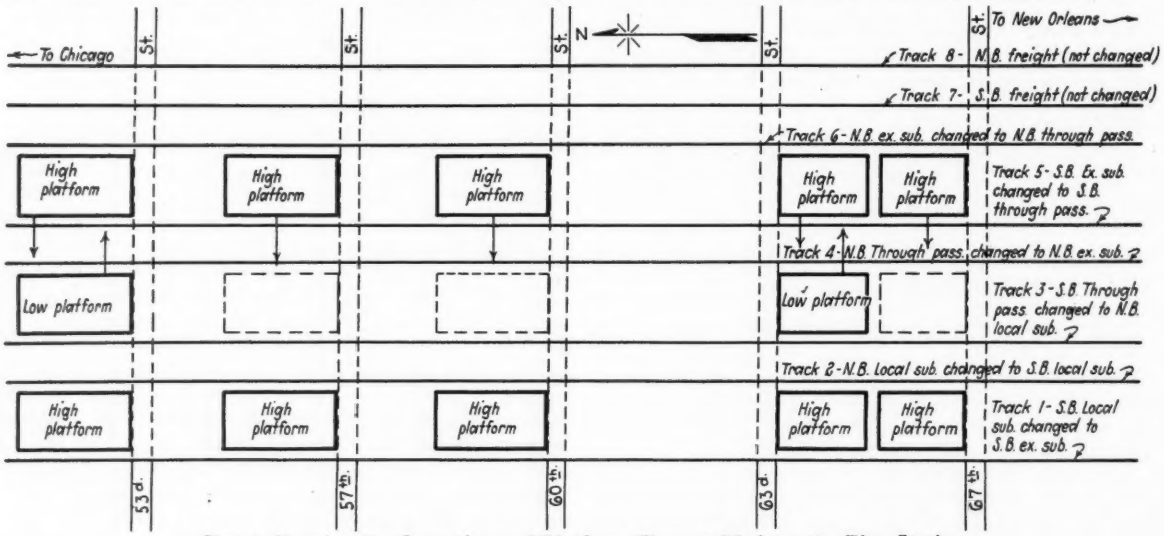
During the past winter we raised track all winter in connection with the elimination of a grade crossing at Buffalo. While the financial saving from a labor standpoint was not very noticeable, the saving from a material standpoint was most appreciable. We received the filling material from a steel plant located on our rails, a haul of approximately six miles. The slag was hot when coming from the furnace and we had no difficulty in dumping it. The steel company had no way of storing this material, consequently if we had postponed the work until spring, we would have been compelled to buy land outside the city and put in a steam shovel, necessitating a long haul, in addition to fouling our stone ballast and entailing large work train expenses. The raise at the highest point was 10 ft., running out to grade. We always managed to have room for 3 or 4 days' dumping over the bank so we could pull the men off this job during snow storms. During the progress of the work we disposed of 40,000 cu. yd. of filling material with a gang of 20 men.

Conditions may limit possibilities in locations, but considerable ground work can be done with good results in the winter time, enabling maintenance men to get 100 per cent efficiency and full man strength from their gangs when reinforced in the spring.

Illinois Central Moves Long Platforms 39 ft. in 10 Hours

Locomotive Power Through a Cable and Snatch Blocks Works Effectively and Quickly Without a Mishap

TAKING advantage of the lull in suburban traffic over Sunday, May 30, and Memorial Day, the Illinois Central completed another step in its Chicago terminal electrification program by moving 1,760 lin. ft. of high (car floor level) suburban platforms, in five locations, over two tracks, to new positions under the final track plan for electric operation. A limit of about 6½ hours between trains for the actual moving of the platforms to clearance for through main line trains, and a maximum of 45 hours in which the platforms could be out of service led to carefully designed and executed plans which worked so effectively that the complete move was made ahead of schedule and without a single delay to traffic. While the critical features of the work lay in moving the express suburban platforms, the relocation of two low through passenger platforms at the same time, added considerably to the problem, as the relocated low platforms were to occupy the old sites of two of the high platforms, and had to be the first in service.



Sketch Showing the Operating and Platform Changes Made at the Five Stations

The moving of the platforms took place between the Illinois Central's 53d street and 67th street stations which, as shown in the accompanying sketch, is in eight-track territory. The stations affected were those at 53d, 57th, 60th, 63d and 67th streets, all of which are express suburban stops, 53d and 63d being in addition, through passenger stations.

In the existing track arrangement tracks No. 1 and 2, numbering from the west, were used for north and southbound local suburban service, tracks 3 and 4 for through passenger service, tracks 5 and 6 for express suburban service, and tracks 7 and 8 for freight service. Under the new plan of operation, track 1 is used for southbound express suburban trains, track 2 for southbound local suburban trains, track 3 for northbound local suburban trains, track 4 for northbound express suburban trains, tracks 5 and 6 for through passenger trains, and tracks 7 and 8 remain in freight service. With these operating changes it is obvious that the low through passenger platform service tracks 3 and 4 had to be moved between tracks 5 and 6, and that the high suburban platforms serving tracks 5 and 6 had to be relocated between tracks 3 and 4. The principal reasons for these changes were to bring the electrified suburban tracks together and thus simplify catenary construction, and to provide all southbound suburban service at one station from one high platform, and all northbound suburban service from the other high platform. This will lessen the confusion to passengers and permit transfer from an express suburban train to a local in the same direction without crossing under the tracks to another platform.

Large Amount of Preliminary Work Done

Four of the five high express suburban platforms moved were approximately 400 ft. long by 15 ft. wide, the other one being 160 ft. by 15 ft., and were constructed of 2-in. plank flooring on 3-in. by 10-in. joists, which are in turn supported on the 8-in. by 10-in. caps of frame bents spaced 16 ft. center to center. For a considerable length, these platforms are covered with a canopy of wood construction, butterfly type, and in addition have enclosed waiting rooms as a protection against inclement weather. In their new locations these platforms were to be made 640 ft. long by the construction of extensions. At 57th, 60th and 67th streets, these extensions were practically completed prior to the platform changes, so that the relocated platforms at these points were readily joined up with the new sections and the entire platform put in service at the same time. Owing to the fact that the relocated high platforms at 53d and

63d streets were to be on the site of the through passenger platforms, which had to be kept in service, it was impossible to build the high platform extensions at these points until the actual change-overs were made. The old low through passenger platforms mentioned were approximately 1,000 ft. long and were constructed of brick with pre-cast concrete curbing on each side. In relocating these platforms in their new positions they were to be reconstructed

View from Headhouse Between Express Suburban Tracks at 63d Street Just Before Platforms Were Moved

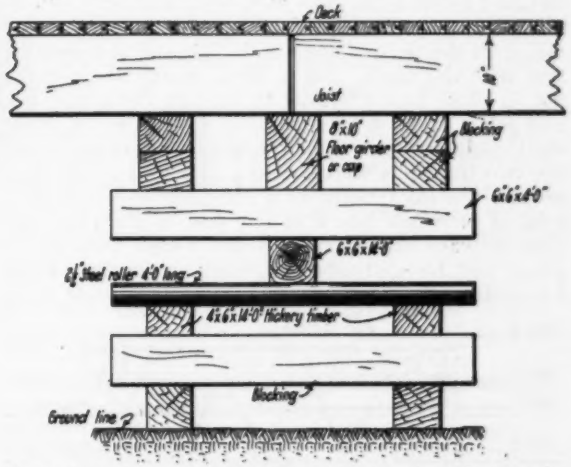
of the same material and extended to a length of 1,190 ft.

The problems attending the moving of the platforms were similar at each station and conditions permitted the performance of a large amount of preliminary work under traffic which, to a large degree, accounts for the ease and rapidity with which the work was done. Each of the high platforms, which were built in 16-ft. panels, was jacked up slightly and the permanent supports replaced by blocking in a crib-like structure, in which were placed steel rollers 2½-in. in diameter. In taking out the posts of

View from Same Location as Other Photograph Showing the Platforms Reversed in Location

the platform bents, a jack was placed under each end of the caps at each panel point in the platform. The temporary supports were then built up as shown in the accompanying sketch, the steel rollers resting on two 4-in. by 6-in. hickory timbers and supporting the platform load through a 6-in. by 6-in. timber. All three of these members extended across the full width of the platform. The rollers in each case were placed high enough in the blocking so that it was possible to move the platforms in a horizontal plane and clear the tops of the rails of the tracks over which they were to move. At 53d and 63d streets, where the high platforms were moved to a location over the low through passenger platforms, the rollers were placed about two inches above the crown of the low platform so that when rolled in place, the low platform would not interfere. All of this work was accomplished some time in advance of moving the platforms, the rollers being well chocked so that the platforms were practically as stable as when on their original substructures.

The direct exchange of the locations of the high and low platforms at 53d and 63d streets greatly limited the amount of work that could be done on the new low platforms, since the high platforms completely covered their new locations. The east concrete curbs of these platforms were, however, cast in place under the high platforms and were ready to



Method of Supporting the Panel Points for Moving the Platforms

retain the platform fill as soon as the high platforms were moved away. The other curbing of the low platforms was not placed until after the high platforms were moved, as it would have interfered with the move and as it was desired to make use of the pre-cast concrete units which would be removed later from the old low platforms.

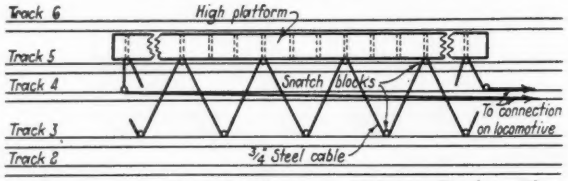
Traffic Governs Time of Moves

Amid much activity on the part of the force on the day of the move, constructing the extensions of the low and high platforms, removing inter-track fences, constructing headhouses, etc., trains moved in and out of the stations at frequent intervals without delay or speed restriction, and all passengers were handled in the usual manner without inconvenience. Tracks 5 and 6 were to be out of service north of the 66th street cross-over at 7 p. m. Saturday, May 29, at which time it was planned to line up for the moving which could not be actually started until after 9:30 p. m. when track 4 was to be out of service and used for the locomotives supplying the motive power. Track 4 was to remain out of service until 4 p. m. Monday, May 31, to permit cutting ends of platform decking on that side to the increased clearance adopted for higher speed electric operation. Track 3 was to remain in service until 12:30 a. m. and the low through passenger platforms at 53d and 63d streets had to be kept in use up to that time to serve through passengers. At 67th street, on account of the cross-over to the South Chicago branch, it was necessary to keep tracks 5 and 6 in service until

11:50 p. m. so that no moving work could be done at this station until after that time. Track 6, the new northbound through passenger track, together with the low platforms in their new locations at 53d and 63d streets, had to be ready for service by 5:30 a. m. the next morning, and track 5 had to be clear for service at 7 a. m. Track 3 was required to be clear for service at 67th street by 7:30 a. m. Sunday morning, and at the other stations by 4 p. m. Monday.

Simple Snatch Block Arrangement Effected

The method adopted for moving the platforms consisted of applying locomotive power through a cable and an arrangement of snatch blocks fastened to the platforms and to track No. 3. The snatch blocks on the platforms were secured by single sling chains fastened around the caps at every third bent and to track No. 3 by chains which extended under the east rail, over the tie, and back under the rail to a connection with the block. All of these snatch blocks were put in place just previous to moving the platforms, and when track 4 was clear at 9:30 p. m., a ¾-in. steel cable was placed in the blocks alternately, and the two free ends were brought to a loop connection around the pilot beam of a locomotive, which was located on track No. 4 at one end of the platform. The runways across tracks 4 and 5 were then put in place, and by a steady backward movement of the locomotive the platform was moved forward as a



Arrangement of Snatch Blocks and Cable During First Half of Move

whole. One man was stationed at each runway, and as soon as rollers were relieved they were brought forward and used again. After the clearing of track 3 at 12:30 a. m., the forward snatch blocks were moved and fastened to track 2 in same manner, and the platforms pulled into their final locations. All the movements of the locomotive at each station were governed by a mouth whistle, two blasts indicating back up, and one, stop.

All of the moves were made without mishap or special difficulty. There was, however, a tendency for the ends of the platforms to move ahead of the center section, causing a slight bow in the platform where this occurred. This was overcome by releasing the cable from the end blocks, putting braces against the platform at these points, and concentrating the pull in the center sections. In this manner the platforms were kept in good alignment throughout the move. The final position of the platforms was made accurate by the use of specially designed gages which consisted of a horizontal member and a vertical arm. When placed across the rails of track 3, the vertical arm indicated the proper height of the platform, while a block on the horizontal member, when against the rail, gave the proper platform clearance.

With the high platforms at 53d street and 63d street in position over the low brick platforms the caps were jacked up, the rollers removed, and the blocking adjusted to provide secure supports for the platforms until the bricks from the low platforms beneath could be removed and the final creosoted timber, footing blocks, posts and braces put in place under the caps. At 57th, 60th and 67th streets, where there were no low platforms to interfere, it was possible to begin the work of installing the permanent framed bents at once.

Immediately following the removal of the high platforms at 53d and 63d streets, the old sites were cleaned out and filled with sand from a work train, to within a few inches of the top of the one curb which had been cast in place previous to moving the platforms. Similarly the new extensions to the low platforms were filled in and then a temporary plank walkway was constructed for the entire length and the platform put into service.

The first platform moves took place simultaneously at 53d, 60th and 63d streets, each of which stations was provided with a light engine. The first platform in place was that at 60th street, the work at this point being completed at about 3 o'clock Sunday morning. The moves at 53d and 63d streets were not completed until about 4:30 a. m., owing to delay necessitated in providing clearance for the midnight southbound passenger train on track 3. After these platforms were in place the forces were moved to the 57th and 67th street stations where the change-overs were completed at 7:30 a. m. Because of the connection to the South Chicago line, the 67th street platform was immediately put into service for suburban trains on track 3.

Aside from preparing the new through passenger platforms for service by 5:30 in the morning, the connecting up of the high platforms in their new locations with the subway headhouses at track level, was the most important work. This was undertaken Sunday and was completed in sufficient time on Monday to permit the use of the platforms for passengers to and from the holiday golf specials at 4 p. m. With the resumption of week-day suburban schedules on Tuesday morning, all of the facilities, while not finally completed, were in full service, and such work as remained, mainly the change-over of the bricks from the old to the new low platforms and the construction of permanent supporting bents for the high platforms, was continued to completion without interfering with passengers or the operation of trains.

Large Force Is Employed on Work

The forces engaged in moving the platforms consisted of about 150 men who were assisted by three light locomotives, a work train and as many men as were needed at times from the 200 or more men engaged in building extensions to the platforms and other auxiliary work. During the night artificial light was provided by a floodlight at each station, mounted on one of the catenary supports between tracks 3 and 4, and also by the electric lights on the high platforms moved, which, by a loop in the lighting circuit, were kept lighted throughout the work.

The changes and additions described were performed under the general supervision of A. F. Blaess, chief engineer of the Illinois Central, and the actual work was in charge of Frank R. Judd, engineer of buildings, who collaborated with the contractor, Wm. H. Brown & Co., Chicago, in planning and executing the moving of the platforms. The track cuts, in connection with the traffic shift, were in charge of Assistant Engineer S. B. Christopher and the signal changes were in charge of H. G. Morgan, signal engineer.

Rail Committee States Position on Transverse Fissures

Valuable Information and Opinion as to Cause of These Failures Are Presented in a Special Bulletin Issued by the A. R. E. A.

[What is without doubt the most informative data now available on the subject of transverse fissures are embodied in Rail Report No. 92 issued as a supplement to the report of the Committee on Rail and presented before the convention of the American Railway Engineering Association on March 10, 1926. This special report, which was published by the association under the signature of G. L. Moore, chairman of the committee, is abstracted below.—EDITOR.]

THE RECENT and disastrous wreck caused by the failure of a transverse fissured rail on the lines of the St. Louis-San Francisco has again concentrated attention of the general engineering public on the cause and conditions favoring development of transverse fissures. To clarify this situation, the Rail committee has been instructed to prepare and disseminate the fissure data now at hand.

In 1923 the committee, also representing the Engineering Division of the American Railway Association, entered into a joint study of transverse fissures sponsored by the Department of Commerce of the United States Government, under the general direction of the Bureau of Standards. Other members of this conference comprise the American Society of Civil Engineers, through their joint sponsorship of the Committee on Stresses in Track, and the rail manufacturers. Special forms covering interior fissure failures had been distributed by the Rail committee among the reporting railways for two years prior to this action. Late in 1923 the work of this conference had developed a "Fact Finding Committee," comprised of one representative from each group, no further action being expected of the conference as a whole until all available facts had been collected and reported back to the main body, and accepted as valid by all members of the group.

Rail Committee Had to Supply Data

Naturally, the Rail committee was expected to furnish its compilation of facts to the other fact finders before they could proceed with their contribution; the rail manufacturers, of course, could not contribute much of the mill history until they had been furnished with a complete list of heat numbers. The work of collection and compilation has proceeded through 1924 and 1925, the records being held open for a considerable time in order to embody the largest number of failures.

The St. Louis-San Francisco wreck, however, was followed by considerable public comment, chiding all of us for not having conquered the transverse fissure.*

At a special meeting of the Rail committee, held on January 26, 1926, the members of the committee unanimously instructed the chairman to make the following statement:

The appended memorandum covers in a general way the complete track history and all mill information available concerning some 16,000 rails failing from simple transverse fissure, up to and including the year 1923. Charts and tables are presented, classifying and correlating these fissures according to the mills in which the rails were made, the years in which they were rolled, the heats of which the rails were a part and the dates of failure in tracks of specific railways.

Certain conclusions based on study of these data have been reached by the Rail committee, among which perhaps the most decisive is that certain rollings from certain mills display remarkable proneness to failures of this type; that certain of the mills whose output goes into service under heavy traffic display through their entire production comparatively few failures, while other mills display over their entire production great quantities of fissures; further that of the mills whose isolated rollings show large fissure production, most rollings show only an average rate.

The committee further believes that while the number of transverse fissure failures reported has been increasing during the last few years, the metal rolled since about 1912 has been in general steadily improving in resistance. It attributes the increase by years entirely to the presence in track, under restricted traffic, of the early rollings whose fissure development proceeded to rupture some years ago under heavy traffic. The committee has charted the decreasing trend of fissure production, which is a very important exhibit in these data.

The committee has reason to believe that the shattering crack is the nucleus of the transverse fissure, and that without its pre-existence no detail transverse fatigue failure has ever been developed from the interior zone in the rail head admittedly stressed by service conditions. It is recognized that the growth or development of a transverse fissure from a shattering crack or nucleus must await the impingment of the rolling load, and that the less the area of contact, the heavier the load, and the greater the number of repetitions, the more rapidly the fissure will grow. These data show, however, that relatively light traffic also develops fissures from shattering cracks, except that the growth is slower.

The committee has reason to believe that the real crux of this problem does not lie in the impinging pressure of the wheel upon the head of the rail, but rather lies in determining the cause of the shattering crack at the steel mill. When the cause is determined, its elimination may be reasonably expected.

Elmer Sperry, of the Sperry Gyroscope Company, Brooklyn, N. Y., has extended to the railways in general an opportunity to co-operate in the final development of his transverse fissure detector. Tests made

*Mr. Moore referred specifically to the editorial "Manchester to Victoria," which appeared in the *Railway Age* of December 5, 1925, together with letters published in subsequent issues commenting on this editorial, were reprinted as a part of this report.

in Mr. Sperry's laboratory indicate that a transverse fissure growing to an extent of 15 per cent of the cross-sectional area of the head may be registered and synchronized on a recording tape, the magnitude of deflection on the tape for this amount of discontinuity being not far from an inch.

Professor A. N. Talbot, of the University of Illinois, chairman of the Committee on Stresses in Railroad Track, further advised the Rail committee that tests in progress for over a year at the University revealed striking dissimilarity in elastic constants between representative specimens of rail steel from heats prone to tranverse fissure, as contrasted with heats of the same chemistry and life in service. These differences are technically expressed as variations in Poisson's ratio, the fissured heats showing an index figure of 0.27, while for the non-fissured heats an index number of 0.23 was registered, with relatively little variation from the average in each case.

Transverse Fissure Statistics†

This compilation includes approximately 15,300 transverse fissures known to be of the simple, or vertical transverse type, unaccompanied by head splits in other planes. It has become generally recognized that compound or coalescent detail fatigue failures arise largely from a segregated condition in the interior of the rail head, and that the vertical transverse component is incidental.

Table No. 1 exhibits the record of the reporting railways with respect to the number of failures in track by years failed from 1910 to 1923, inclusive. The track mileage represented embraces over one-half from year rolled to 1923, inclusive, for each year's rolling, running as far back as the rollings of 1889. The total accumulation for each year's rolling indicates the increasing tendency toward fissures, reaching its present maximum in the rollings of 1910.

Table No. 4 exhibits the heats in which fissures have occurred classified by multiple failures from date rolled to 1923, inclusive. It is interesting to note that the number of heats showing more than one fissure is approximately 1,800 as against about 7,200 heats showing only one fissure. This shows the chance of a heat developing more than one after having suffered its first to be actually 1 to 4. It further shows a total of about 900 with three or more.

Table No. 2

Interior Fissure Failures classified by carbon content

Per Cent	*No. Failures*
.58	8
.59	5
.60	21
.61	20
.62	83
.63	113
.64	135
.65	156
.66	176
.67	211
.68	245
.69	253
.70	248
.71	257
.72	278
.73	197
.74	233
.75	238
.76	101
.77	64
.78	62
.79	53
.80	37
.81	27
.82	28
.83	13
.84	11
.85	7
.86	9
.87	5
.88	1
.89	1
.90	2
Total	3298

Carbon .58 to .70 inc. 1674 Interior Fissure Failures
Carbon .71 to .90 inc. 1624 Interior Fissure Failures

Table No. 1

Simple Transverse Fissure Failures by Railroads and by Year Failed

Railroad	1910	1911	1912	1913	1914	1915	1916	1917	1918	1919	1920	1921	1922	1923	Total
A. T. & S. F.	.....	.....	.....	1	.....	1	6	19	13	25	177	220	134	126	722
Boston & Albany	.....	.....	.....	.....	.....	2	1	.....	1	17	23	30	25	15	114
Boston & Maine	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	35	35
B. & O.	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	212	212
B. R. & P.	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	9	11	20
C. & O.	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	6	26	46	78
Cent. of Ga.	.....	.....	.....	.....	.....	.....	3	51	52	52	23	41	31	29	282
C. C. C. & St. L.	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	2	1	3
C. R. I. & P.	.....	.....	.....	.....	.....	1	2	6	1	2	11	25	37	75	160
C. M. & St. P.	.....	.....	.....	.....	.....	.....	.....	.....	2	.....	6	5	14	11	38
Can. Pac.	.....	.....	.....	.....	.....	.....	.....	.....	.....	4	.....	8	16	59	87
C. B. & Q.	.....	.....	.....	.....	.....	.....	.....	.....	.....	1	7	34	101	87	230
D. L. & W.	.....	.....	17	20	20	32	76	112	197	193	240	169	91	80	1247
Erie	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	15	43	58
El Paso & S. W.	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	8	6	14
Hocking Valley	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	13	53	66
Illinois Central	.....	1	1	.....	.....	.....	2	3	4	35	121	190	372	556	1285
Ind. Harbor	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	1	3	4
L. & N.	.....	.....	.....	Prior to 1919			.....	.....	474	9	17	33	43	77	653
Lehigh Valley	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	57	89	146
L. & N. E.	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	32	32
Lehigh & Hudson	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	1	.....	4	5
Long Island	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	2	8	7	17
Mich. Cent.	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	2	2
Mo. Pac.	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	2	8	10
M.-K.-T.	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	2	11	13	26
N. C. & St. L.	.....	.....	.....	.....	2	3	1	4	.....	.....	1	2	2	8	23
Nor. & Western	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	3	17	20
N. Y. C. & St. L.	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	2	2
N. Y. N. H. & H.	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	12	28	40
N. Y. C. (East)	.....	.....	.....	4	43	76	124	101	67	84	88	93	136	107	923
N. Y. C. (West)	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	1	18	37	16	72
Nor. Pac.	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	42	39	81
Penna.	.....	.....	.....	.....	65	370	532	550	727	1114	1129	1104	904	649	7144
Reading	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	52	112	164
So. Pac.	.....	.....	15	4	6	11	15	4	2	9	6	130	118	143	463
Sou. Ry.	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	24	24
Un. Pac.	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	36	262	557	855
All Roads	.....	1	33	29	136	496	762	850	1540	1545	1850	2149	2584	3382	15357

the total of the American railway systems. Table No. 2 classifies fissure failures whose mill analyses are available by carbon content, together with an estimate of the percentage of high and low carbon heats present in track and a rating on this basis. Table No. 3 classifies all the fissure failures accumulated

†Submitted by John B. Emerson, formerly engineer of tests, Committee on Rail.

The number of heats with nine or more is 66, while the number with eight is 23, or odds in favor of additional fissure being about 3 to 1. Following the column down into the extreme number of multiple fissure after failures is not productive, as of course applying the laws of probability as checked by competent mathematicians, the chance of any given heat developing two fissures would be not far from 1 to 2,000, while applying the actual data, the chance of a heat developing two fissures appears to be about 1 to 500. The chance of a heat developing three fissures, if all heats were similar in character, in theoretical probability would be about 1 to 200,000, whereas by the data the chance appears to actually be about 1 to

Table No. 3

Accumulated Simple Traverse Fissure Failures from year rolled to 1923, inclusive, by years rolled.

Year	All Mills
Unk.	133
1889	2
1890	6
1891	8
1892	5
1893	3
1894	9
1895	8
1896	8
1897	30
1898	42
1899	50
1900	35
1901	69
1902	125
1903	178
1904	259
1905	405
1906	173
1907	248
1908	236
1909	1452
1910	1920
1911	1662
1912	1666
1913	1729
1914	1112
1915	1118
1916	719
1917	943
1918	344
1919	305
1920	165
1921	93
1922	69
1923	28
Total	15,357

Table No. 4

Total number of Known Heats Displaying Simple Transverse Fissures, from date rolled to 1923, inclusive, segregated as to number of fissures per heat.

Known Heats	All Mills	Cumulative
Heats with 1 fissure each	7202	.....
Heats with 2 fissures each	921	1814
Heats with 3 fissures each	356	893
Heats with 4 fissures each	225	537
Heats with 5 fissures each	116	312
Heats with 6 fissures each	68	196
Heats with 7 fissures each	39	128
Heats with 8 fissures each	23	89
Heats with 9 fissures each	20	66
Heats with 10 fissures each	9	46
Heats with 11 fissures each	11	37
Heats with 12 fissures each	8	26
Heats with 13 fissures each	3	18
Heats with 14 fissures each	4	15
Heats with 15 fissures each	5	11
Heats with 16 fissures each	1	6
Heats with 17 fissures each	2	5
Heats with 18 fissures each	0	3
Heats with 19 fissures each	1	3
Heats with 20 fissures each	0	2
Heats with 21 fissures each	0	2
Heats with 22 fissures each	0	2
Heats with 23 fissures each	0	2
Heats with 24 fissures each	1	2
Heats with 25 fissures each	0	1
Heats with 26 fissures each	1	1
Total Fissured Heats	9016	.....
Total Fissures	13233	.....

very few heats remain in track after showing nine fissures.

Estimates on the number of rails and heats in track made by the committee, which checks pretty closely with the estimate made by Mr. Borland,‡ indicates that only about one heat in 50 ever shows a fissure during its useful life and therefore that the next fissure should, if there is no difference in the character of the heats, fall in a heat other than one in which the first failure occurred. According to this, and 1,200. The chance of any given heat having four or more failures would continue, according to the law of probability, to lessen ad infinitum.

Plate No. 1 presents certain fundamental unweighted data drawn from the tables. Curve A shows the increasing number of transverse fissures reported as occurring in track by calendar years. Curve B exhibits the open heart rail production of the United States in per cent of total rail production. It will be observed that transverse fissures became a serious factor just when open hearth steel became a considerable proportion of American rail. Curve C exhibits the accu-

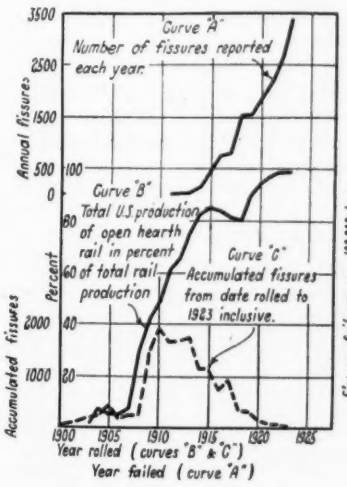


Plate 1—Unweighted Rail Failure and Production Statistics.

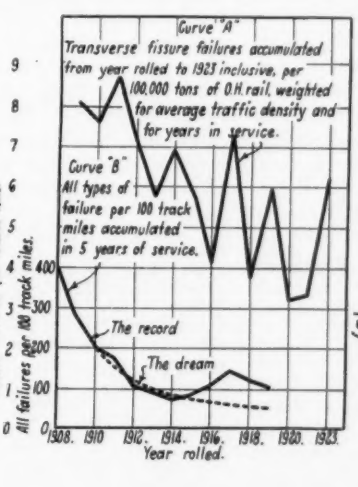


Plate 2—Fissure Failures and other Failures Compared.

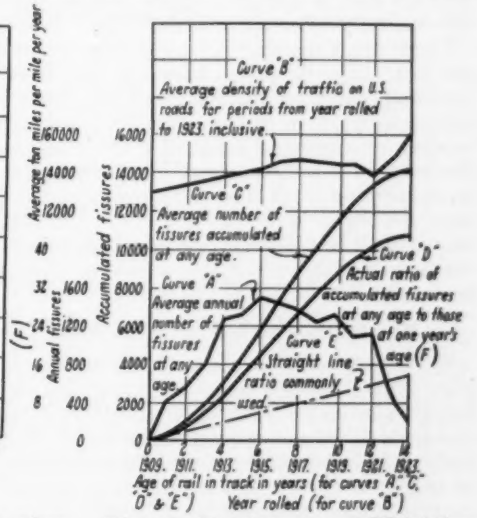


Plate 3—Development of Weighting Factors used in Plate 2.

‡W. P. Borland, director, Bureau of Safety, Interstate Commerce Commission.

mulated fissures of all annual rollings, including the rollings of 1923.

While Curve A in Plate 1 might appear superficially as indicating an increasing fissure menace, Plate 2 exhibits as Curve A the actual decreasing slope of fissure tendency in the rollings subsequent to 1911. While the rolling of 1910 now shows the largest number, it is probable that the rolling of 1911 will pick up failures to a greater total than that of 1910.

This curve has been compiled by weighting Curve C shown on Plate 1 by years in service, by tons in track, and by the increasing traffic densities. The weighting factors are shown in later plates. This chart indicates the real decreasing menace, and is further extremely interesting when compared with the "Dream Curve" and the actual curve of decrease in general rail failures from rollings over the same periods, which is shown on the same plate as Curve B. Comparison inevitably draws thought toward the conclusion that general betterment in mill practice has materially decreased the tendency toward failures of all types, the effect being just as pronounced in transverse fissures as in the rest.

Plate 3 exhibits the various weighting factors used in compiling the data for Curve A on Plate 2. The principal factor in influencing the final result is Curve A, showing the average annual number of failures of any age of rail in track. While the curve shows a gentle slope after the sixth year, it must be realized that on eastern roads much of the rail is out of track by the end of the sixth year, while on western roads little of the rail comes out of track before about the eleventh year. The next most important factor is the curve showing the increasing traffic densities over the last 15 years.

Why The Proper Reporting of Material Used is Important*

By H. L. TONKINSON,
Roadmaster's Clerk, Kansas City Southern, Texarkana, Tex.

ANY MATERIAL placed in the track under proper conditions will render its full service, regardless of the fact that it was never reported as used and therefore never charged out of stock by the accounting department. However, the failure to report the material used will invariably result in large discrepancies in the inventory of stock on hand at any time, and there being no positive way to account for such discrepancies, we must presume it was used and not charged out, was lost or was stolen, and the section foreman, being entrusted with the care and proper use of all material delivered to him, is justly held responsible for it.

There are a number of cases where material used and not properly charged out by the foreman is a total loss and must therefore be considered as an absolute waste. In many jobs of constructing, extending or changing tracks for an industry, the industry pays a large portion, if not all of the expense in connection with the job; therefore, if a single item of labor or material is omitted or is not properly shown on the daily reports that same item will be omitted or improperly shown on the bill which is rendered when the job is completed.

Maintenance of Industry and Joint Tracks

A portion of all labor and material used on any joint track is billed against the company that uses and helps to maintain that track, and if all of that labor and material is not correctly shown on the daily reports it is impossible for the accounting department to render a correct bill. Our company has specific contracts with most of the industries we serve, providing that the industry is to pay a portion of all of the maintenance expenses for the upkeep of a definite portion or all of the industry track, therefore a large portion of that labor and material, if it is not properly charged out on daily reports, is either a direct loss or else it is necessary to write a number of letters in order to obtain full information before a proper bill can be rendered for labor and material.

In places where switching is done over our tracks by the engines of another company, it frequently develops that the switching crew fails to line our switches properly, sometimes causing damage from derailments, and in all such cases where our reports show definitely that the accident was due to the carelessness of the other company, a bill is rendered against that company to cover all labor and material consumed in making the necessary repairs. When our foremen fully realize the great importance of showing complete information on all daily reports I am sure they can all be depended upon to rally to the slogan, "Prevent Waste." There are very few cases where we can be justly charged with wilful waste of company material, yet, as previously stated, every inventory discloses unreasonably large discrepancies in our material stock which must in some way be due to that disease germ which is commonly called carelessness.

Switch Material Reclaimed

We keep two men in Texarkana at a total salary of $9.76 per day, who spend the greater part of their time repairing frogs, switch stands, switch points, etc. In this way we recover from the scrap all material that can be repaired and it is put back into service where needed, except that it is not used in the main line. A large amount of this material, when taken out of the main line is shown by the foremen as second-hand material and taken into stock as such at about one-half the value of new material. Then in a few days or few weeks the scrap car comes along and it is loaded out as scrap and shipped to Texarkana to be repaired. After it is repaired it is again shipped out to the sections where it is needed for use in back tracks and if properly charged out by our foreman it is reported as "Repaired Material" at a value of about one-fourth of the new material. Thus it can be readily understood that switch material released as second-hand is never cleared out of our stock. I believe that if our foremen would al-

*Abstract from a paper presented at a recent meeting of the Kansas City Southern Maintenance of Way Association held at Texarkana, Tex.

ways report as scrap all switch material from the main line, unless they know positively it will be used again before it is repaired, it will help a great deal in keeping our records correct.

Carelessness Real Cause of Errors

As revealed by our last inventory, there were inexcusable discrepancies in both spikes and tie plates. I cannot concieve how this material, if actually used in our main line, could in the true sense of the word be a waste of material, but as the accounting department has no possible means of obtaining a record of its use, it naturally is regarded as a waste by our department. Why does the foreman who is trusted with the handling of his laborers, the care and use of material, and to a certain extent with the lives of all persons who ride trains over his section fail to charge out properly all material used and to show a credit for all material released? It seems to me that there can be but two reasons: first that he does not fully understand just what is necessary to show on his reports to enable the accounting department to handle its part of this business properly; or, second, that he is too careless to give a correct record of all his transactions. When we, as individuals, can be made to realize fully what our carelessness is costing, I am sure we can each be counted upon to strive faithfully to eradicate carelessness and to prevent waste in every possible way.

Discussion

H. F. Haig, signal engineer, in discussing the present daily report forms which were adopted several years ago, said that efforts were made to get a form so simple that there would be no difficulty in filling it out correctly. The thought was that there were just four things to bear in mind; (1) what was done; (2) where it was done; (3) what was used; and (4) what was released. The important thing is to make out the report at the end of the day's work, while it is fresh in the mind. W. J. Lank, division engineer, speaking of the discrepancies as revealed by the inventory, suggested that some of the trouble might be due to too great haste on the part of the inventory party, thus causing it to miss some of the material, and also to the fact that some material was overlooked because it was not placed where it could be seen readily by the inventory party. As a remedy he suggested that all material should be placed where it can be found readily and that the section foreman should accompany the inventory party over his section to point out all the material on hand. E. McGann, section foreman, also thought the foreman should go over the section with the inventory party, or with the roadmaster in advance of the inventory to be sure that no material was overlooked and also that it might be classified properly. A. N. Reece, chief engineer, discussed the dislocation of the program of work occasioned by inventory shortages, due to having to take up the discrepancies in the last month of the year. He called attention to the fact that in only one month in 1925 did they spend their entire appropriation for maintenance and that there was not a month in which they could not have taken up all the charges for the material that was actually used. Had it not been for the accrued credits the situation in December would have required even more drastic reductions in force than were made.

Roadway and Structures Purchases Are on the Increase

THAT THE purchases made by the railroads for materials and supplies was largely increased during 1925 as compared with 1924, is indicated by the figures recently compiled by the Bureau of Railway Economics, which show that the total purchases of Class I roads were not only greater during 1925, but that a considerable portion of the increase was due to larger purchases of certain classes of roadway materials. The report also shows that while the total expenditures of the Class I roads decreased during the first quarter of 1926 as compared with the corresponding period of 1925, the expenditures for roadway and structures increased $19,200,000.

Analyzing the total expenditures during 1925, which amounted to approximately $1,392,000,000 as compared with the expenditure of approximately $1,343,000,000 during 1924, it is interesting to note, by reference to Tables A and B, that the two outstanding increased purchases of roadway materials were of rail and ballast, the increase in rail purchases amounting to about 400,000 gross tons, while that in ballast amounted to approximately 7,400,000 cu. yd. These two increased purchases during 1925 involved the additional expenditure of more than $23,600,000 over that in 1924.

The total expenditures of $419,254,603 for iron and steel products in 1925 was 15 per cent higher than the expenditure of $365,610,000 in 1924. This is a result of the approximate 20 per cent increased expenditure for steel rails and the increase of about 12 per cent in the expenditures for other iron and steel products. One-third of the total iron and steel purchases of the railways in 1925 were in the form of rails, while the remainder was distributed among plates, bars, shapes, track accessories and similar commodities.

The total expenditures in 1925 for forest products amounted to $170,305,000, which is considerably less than the expenditures made in 1924 and 1923 when purchases of these materials amounted to $180,872,000 and $232,511,000 respectively. The entire reduction in the expenditures for forest products during the past year is accounted for in the reduction in the purchases of cross ties, switch ties and bridge ties. During 1924 the number of cross ties purchased was 98,130,000, while in 1925 it was only 87,964,517, and the board feet of switch ties and bridge ties purchased dropped from 329,040,000 in 1924 to 306,444,000 in 1925. The total production of forest products in 1925 is estimated by the National Lumber Manufacturers' Association at 36,000,000,000 board feet, on which basis the railways of the country purchased 20 per cent of the total.

The trend of capital expenditures for roadway and structures is strikingly in contrast with that for equipment which is evidenced by reference to Table C which shows the total capital expenditures made by the Class I roads for additions and betterments during each year since 1922. In this table it is seen that there has been a steady increase in expenditures for roadway and structures in both amount and percentage, although

for the last three years there has been a decrease in the total expenditure for all improvement work done on the railroads. Thus in 1923 the railroads spent $381,000,000 for improvements to roadway and structures (including labor and material) or 36 per cent of the total of $1,059,000,000, while in 1925 the expenditures for roadway and structures totaled $415,000,000 or 55 per cent of the entire sum of $754,000,000 chargeable to additions and betterments work.

The capital expenditures made during the first quarter of 1925 and 1926 are given in Table D which shows that while capital expenditures on the whole are still on the decrease, those for roadway and structures are still on the increase. Thus, it will be noted that whereas the capital expenditures for additional track, heavier rail, additional ballast, shops and enginehouses and other roadway materials, amounted to $71,600,000 in the first three months of 1925, they reached a total of $90,800,000 during the same period of 1926, an increase of $19,200,000 or about 30 per cent. The ratio of expenditures for roadway and structures to total expenditures in the first quarter of 1925 cannot be directly compared with the ratio of annual expenditures for roadway and structures to total expenditures in the preceding years. In the first quarter of 1926, however, the ratio of roadway and structure expenditures to the total expenditures was 54 per cent, while the ratio for the first quarter of 1925 was 42 per cent, which shows a continuation of the trend of increased expenditures for roadways and structures, revealed in past years. The capital expenditure authorizations for roadway and structures made up to April 1, 1926, including unexpended authorizations carried over from 1925, amounted to $514,300,798, while the total capital expenditure authorizations for all classes of materials equipment during this same period reached a total of $821,879,707. The entire capital program thus far laid down for 1926 corresponds closely with that of the same period of 1925 and if 1926 continues to follow the trend paralleling that of 1925 as it did during the first quarter, it is estimated that the total capital expenditures for the year will be in the neighborhood of from $750,000,000 to $800,000,000.

Statistics on Purchases and Expenditures

Table A—Purchases of Materials and Supplies by Class I Railways

Item	1925	1924	1923
Fuel—			
Bituminous coal	$347,661,675	$373,483,000	$519,007,000
Anthracite coal	9,982,115	14,497,000	18,195,000
Fuel oil	97,462,744	79,700,000	75,867,000
Other	4,358,807	3,976,000	4,731,000
Total	459,465,341	481,656,000	617,800,000
Forest Products—			
Cross ties	95,453,178	111,442,000	124,743,000
Switch and bridge ties	11,125,618	13,038,000	99,798,000
Timber and lumber	55,110,800	49,566,000	
Other	8,615,435	6,826,000	7,970,000
Total	170,305,031	180,872,000	232,511,000
Iron and Steel Products—			
Steel rail	97,728,989	79,326,000	80,965,000
Other	321,525,614	286,284,000	383,990,000
Total	419,254,603	365,610,000	464,955,000
Miscellaneous—			
Cement	4,697,258	5,141,000	6,120,000
Lubricating oil and grease	13,656,286	13,158,000	15,678,000
Metal and metal products other than iron and steel	45,318,843	39,049,000	57,245,000
Ballast	17,817,736	12,608,000	344,394,000
Other	261,528,356	254,961,000	
Total	343,018,479	324,917,000	423,437,000
Grand total	1,392,043,454	1,343,055,000	1,738,703,000

Table B—Quantities of Materials Purchased by Class I Railways

Item	Unit	1925	1924	1923
Fuel—				
Bituminous coal		129,325,480	126,372,000	154,902,000
Anthracite coal	Net tons	3,780,113	4,673,000	5,016,000
Fuel oil	Gallons	3,043,783,152	2,848,550,000	2,962,619,000
Forest Products—				
Cross ties	Number	87,964,517	98,130,000	113,907,000
Switch and bridge ties	Bd.—ft.	306,444,000	329,040,000	2,388,785,000
Timber and lumber	Bd.—ft.	1,416,111,000	1,296,430,000	
Iron and Steel Products—				
Steel rail	Gross tons	2,179,201	1,778,750	1,888,600
Miscellaneous—				
Cement	Barrels	2,104,206	2,210,800	2,416,000
Ballast	Cu. yds.	21,672,754	14,265,000	*

*Not reported separately.

Table C—Trend of Capital-Expenditures Since 1922

	Total Additions and Betterments	Equipment	Roadway and Structures	Per Cent Roadway to Total
1922	$429,000,000	$253,000,000	$176,000,000	41
1923	1,059,000,000	687,000,000	381,000,000	36
1924	875,000,000	490,000,000	385,000,000	44
1925	754,000,000	339,000,000	415,000,000	55
1925*	169,300,000	97,700,000	71,600,000	42
1926*	165,700,000	74,900,000	90,900,000	54

*Expenditures for first quarter of year only.

Table D—Capital Expenditures of Class I Railways in 1926

	Authorizations up to April 1, 1926*	Capital expenditures—First quarter 1926	1925
Locomotives	$89,201,549	$18,300,000	$12,700,000
Freight-train cars	147,226,280	44,500,000	73,300,000
Passenger-train cars	56,120,605	9,000,000	9,500,000
Other equipment	15,030,475	3,100,000	2,200,000
Total equipment	$307,578,909	$74,900,000	$97,700,000
Additional track	$178,256,451	$30,900,000	$21,500,000
Heavier rail	31,800,365	7,200,000	5,600,000
Additional ballast	10,948,198	1,800,000	1,400,000
Shops and engine houses	41,402,416	8,200,000	7,300,000
All other	251,893,368	42,700,000	35,800,000
Total, roadway and struct.	$514,300,798	$90,800,000	$71,600,000
Grand total	821,879,707	165,700,000	169,300,000

*Includes carry-over from 1925.

RESOLUTION

MAINTENANCE OF WAY DEPARTMENT

WHEREAS, There were 399,000 employes in the *Maintenance of Way* Department of the Railroads of the United States, of whom 450 were killed and 27,172 were injured in 1924, representing *thirty percent.* of all fatalities and *twenty-two percent.* or all injuries to *employes on duty*, and

WHEREAS, The General Causes of accidents and percentage of accidents due to each general cause are as follows:

PHYSICAL CONDITIONS:

Defective material and equipment, lack of safeguards, litter or other physical hazards..... 5%

HUMAN FACTOR:

(a) Violation of rules and other forms of negligence.... 10%

(b) Carelessness, thoughtlessness, indifference, ignorance or physical and mental unfitness and misadventure.. 85%

and,

WHEREAS, The means of preventing accidents are as follows:

PHYSICAL CONDITIONS:

Improved design and construction, better maintenance and installation of necessary safeguards.

HUMAN FACTOR:

(a) Improved training, supervision and discipline.

(b) Safety organization, education, persuasion, cooperation and first aid and medical attention, and

WHEREAS, Injuries due to being Struck by Trains; Loading, Unloading and Handling Rails, Ties and Timbers and Other Material; Handling and Use of Hand Tools and Operating Hand and Motor Cars, constitute the majority of injuries to *Maintenance of Way* employes, and

WHEREAS, Division Engineers are responsible for the introduction of appropriate safety measures in the Maintenance of Way Department,

Resolved, That the Safety Section, American Railway Association, appeals to all *Division Engineers* and other officers in charge of maintenance of way work to provide, through their Supervisors, Road Masters, Track Foremen and other supervisory forces, full and complete safety supervision and training of *Maintenance of Way* employes, particularly new and inexperienced men, to the end that maximum safety may be assured and a *thirty-five percent.* reduction in casualties by 1930, which is the safety goal of the railroads, may be achieved. Be it further

Resolved, That it is the sense of the Safety Section that if proper and continuous supervision, training and discipline is applied to prevent *accidents due to being struck by trains*, the yearly toll of 300 deaths to Maintenance of Way employes from this cause will be greatly educed.

Resolution Passed by the Safety Section of the American Railway Association at the Annual Meeting in April

Committee on Forest Products of A. R. A. Recommends Reform

Advance Planning of Tie Needs, Better Storage of Lumber and Thorough Inspection Are Urged

RECOGNIZING that the Class I roads of the United States spend in the neighborhood of $200,000,000 annually for forest products and thus constitute a market for about 20 per cent of the country's total lumber production, the Forest Products committee, A. R. A., Purchases and Stores division, has continued during the past year in the study of the railroads' relation to the lumber problem, and in its report submitted to the association at its annual meeting in Atlantic City June 10-12, presented much valuable information and made many important recommendations.

With particular reference to the products used in the maintenance of way department, the report stresses the need for systematic scheduling of forest products requirements well in advance of actual use; the advisability of a well-trained, adequately supervised force of inspectors, and the stricter enforcement of specifications in inspection practices. It also recommends the plain and permanent marking of cross ties and urges the more general adoption of standard methods of stacking and protecting ties, submitting illustration of standard methods of stacking which have been found best adapted to conditions on many roads. The report of the committee, of which H. R. Condon, assistant forester of the Pennsylvania, is chairman, is in part as follows:

The extent to which emergency purchases continue to be made causes the committee to again stress the fact that forest products can be purchased economically only when demands are made known sufficiently in advance of needs to permit of orderly procurement and distribution. Purchasing and stores officers are urged to use all means possible to stimulate timely requisitions. It is believed that appropriate action would be obtained more readily if it were generally appreciated that when mill purchases are not possible, because of delivery requirements, a substantial premium is paid for quick delivery of many items from yard stocks.

The extensive use of treated maintenance-of-way forest products makes it essential to have needs for that class of material made known in time to permit of procurement and delivery for seasoning preliminary to treatment. While some kinds of wood may be artificially seasoned in a short time the cost of such drying is excessive. From 6 to 15 months generally are required for economical seasoning.

In order that stock accounts always may be held to the lowest figure consistent with safety, schedules of procurement and distribution should be formulated whenever practicable, particularly for maintenance-of-way materials. A plan now in effect, and one which the committee believes should be extended in practice, is that of planning at least 12 months in advance of use for the monthly procurement and distribution of cross, switch and bridge ties, bridge timbers, piles, etc. In that manner commitments, quantitites distributed on line and stored in seasoning yards are minimized and adequate. The table represents such a schedule for use in the control of cross-ties on a road using both treated and untreated woods, where an average of 12 months is required to season ties before treatment and a distributed stock at all times at least equal to the consumption scheduled during the two succeeding months is believed to be the lowest line stock compatible with safety. With modifications the form is applicable to other forest products, and the use of such a control chart is recommended.

A well-trained, adequately supervised and mobile force of inspectors sufficient in numbers to do the work required is essential for economical inspection. The measure of efficiency of such a force is the character of the material accepted and not merely the cost of inspection. The cost of inspection per unit purchased is useful for comparisons but should not be construed as a universal index of efficiency. A very low unit cost may represent a loss to the consumer of forest products in inverse ratio to the inspection cost, due to the acceptance and payment for non-standard material.

Undermanned inspection forces necessitating the frequent use of "emergency" or "part time" inspectors are difficult to administer and apt to be very costly in the results obtained. It is the conviction of your committee that capable inspectors generally should be employed continuously in order to have them available when needed.

During periods of lessened demand for inspection service efforts should be made to divert excess inspectors to other profitable employment, in order that their services may be had when required. The training of new inspectors is no less costly than education in other branches of service where knowledge and experience can be gained only by experience under adequate supervision.

It has been found desirable to hold periodical group meetings of inspectors for the purpose of discussing inspection problems as well as the giving of instruction.

Your committee supplements previous reports and

recommendations that all forest products be purchased under definite specifications, the terms of which are thoroughly understood and impartially applied by inspectors of forest products, by urging that supervisory officers insist that terms of purchase actually be enforced. It is believed that purchase and inspection of cross-ties permits of more justifiable criticism of failure to insist on contract terms being met than in the procurement of other forest products. The conditions reported by this committee in 1924 under "Inspection" still obtain to a considerable extent.

Each cross-tie should be plainly and permanently marked with the grade at which it was accepted. Otherwise the accounting and checking of the ability and trustworthiness of inspectors is made difficult if not impossible.

Cross, switch and bridge ties of kinds of wood which tend to check or split excessively during seasoning should be protected against such injury by having S-irons or other anti-splitting devices inserted in their ends as soon as practicable after manufacture.

Standard methods of stacking ties should be devised to meet the requirements of each road and should be adhered to. General stipulations for forest products storage were adopted in 1919, but the indifferent application of recognized principles on some roads indicates

Month	Consumption Classes U and T	Distributed Stock (Available for Use)			Stock at Treating Plants Class T	Total Stock on System Classes U & T	Receipts on R/W		Receipts At Tr. Pits for Stock Class T
		Class U	Treated Class T	Total Classes U & T			Foreign and R/W Class U	From Treating Plants Class T.-Tr	
January	27,000	9,000	289,000	298,000	900,000	1,195,000	7,000	18,000	18,000
February	39,800	12,000	280,000	292,000	900,000	1,192,000	9,000	27,000	27,000
March	78,000	15,000	273,000	288,000	900,000	1,188,000	11,000	63,000	63,000
April	121,000	13,000	272,000	285,000	900,000	1,185,000	10,000	108,000	108,000
May	145,000	10,000	274,000	284,000	900,000	1,184,000	9,000	135,000	135,000
June	140,000	8,000	282,000	290,000	900,000	1,190,000	11,000	135,000	135,000
July	142,000	7,000	289,000	296,000	900,000	1,196,000	13,000	135,000	135,000
August	90,000	6,000	292,000	298,000	900,000	1,198,000	8,000	90,000	90,000
September	94,000	5,000	293,000	298,000	900,000	1,198,000	5,000	90,000	90,000
October	66,000	3,000	296,000	299,000	900,000	1,199,000	4,000	63,000	63,000
November	26,000	5,000	291,000	296,000	900,000	1,196,000	5,000	18,000	18,000
December	23,000	7,000	290,000	297,000	900,000	1,197,000	6,000	18,000	18,000
Totals	1,000,000						100,000	900,000	900,000

How One Road Schedules Its Cross Tie Requirements

a need of corrective action. It is essential that bearing surfaces be minimized and kept as near the ends of ties as possible.

Bridge-ties may be stacked in the same manner as cross-ties.

Switch-ties 12 ft. or shorter in length also may be stacked as are cross-ties, but longer lengths should have intermediate bearings to prevent sag and distortion when stored for long periods, as when being seasoned.

Substantial bearing must be provided under and in high stacks of ties because of the weight which must be carried, otherwise ties will be damaged by crushing at contact points. Comparatively small "stickers" for separation of layers are not generally satisfactory because of their effect in retarding seasoning, due to reduction in size of air passages. The retardation of air circulation usually results in slower seasoning and the holding of ties for a longer time before they become dry enough for proper preservation. Stickers also have been found undesirable in some seasoning yards because of the expense of supplying and handling them, and the loss due to breakage in use.

In order to prevent stack burning of the necessarily extensive contact areas in stacks of the longer lengths of switch-ties it has been found economical to coat the upper and lower surfaces of cross pieces or bearings with creosote. Such protection may be given at slight cost by applying creosote with a swab or heavy brush as the ties are stacked.

The Bureau of Safety Reports on Derailments

THE INTERSTATE Commerce Commission has issued reports recently on two derailments which were investigated by the Bureau of Safety in which it was evident that the failure of the section forces to protect defective track by proper flagging was primarily the cause of the accidents. A brief review of the reports is given on account of their interest to members of the maintenance of way department.

Failure to Flag Causes Derailment on Passing Track Used for Main Track Movements

On March 22, 1926, an eastbound passenger train on the New York, Chicago & St. Louis was derailed near Hamburg, N. Y., resulting in the death of the engineman. The accident occurred at the west switch of an eastbound passing track through which trains were being detoured while repairs were being made on the main track between the passing track switches, and was due to a speed too great for the condition of the track. The standard of maintenance on the main track was good but the passing track was poorly maintained and was not safe for the movement of trains at any but low speeds, while the train was moving at the rate of about 30 miles an hour when it was derailed.

In the vicinity of the place of the accident single main tracks owned by the Pennsylvania and the New York, Chicago & St. Louis are located adjacent to each other and are operated jointly by the two carriers as double track, the Pennsylvania owning the track used as the eastbound main. The switch was constructed of 100-lb. rails with a No. 10 frog, giving a curvature of 7 deg. 20 min. through the lead. The switch stand was of the ground throw type, having a mast about 7½ ft. high, with a white indication by day when the switch was closed and red when set for a movement to the passing track. The switch stand was located on the enginemen's side of an eastbound train and the indications were visible for about 1300 ft. Approaching the switch from the west the alinement is tangent for a distance of about one mile and the grade is generally descending to a point about 600 ft. from the switch, where it changes to 0.3 per cent ascending. The weather was clear at the time of the accident, which occurred at 2:12 p. m.

On account of a derailment due to a broken wheel the ties in the main track had been damaged from about one mile west of the switch to a point about 50 car lengths east of the switch, and a speed restriction of 10 miles an hour over this portion of the track had been posted on the bulletin boards. The members of the crew of the derailed train had no knowledge of the speed restriction as they had had no access to a bulletin board after the notice was issued and the dispatcher had failed to include this train in the list of those to be notified by telegraph. The engineman made a service application of the brakes when within about 1100 ft. west of the switch while running at the rate of from 45 to 50 miles an hour but failed to reduce the speed of train sufficiently to prevent the derailment.

In arranging for routing trains through the passing track the section foreman communicated with the operator at Lake View by telephone and there was a conflict in the statements made by these two

employees as to the details of the conversation, the foreman saying that he had asked that the passing track be used by all trains, which he understood the operator to agree to. He then set the switch for the passing track but did not provide flag protection as required by the rules as he did not consider it necessary. The operator stated that he had informed the foreman that the passing track was to be used only by freight trains and cautioned him to flag all such trains. The Bureau held that the primary cause of the accident was the failure of the section foreman to provide proper flag protection.

Broken Switch Stand Crank Causes Serious Rerailment on a Western Railroad

On January 14, 1926, an eastbound passenger train, consisting of a locomotive and six cars, was derailed on a single track line of the Missouri Pacific at Blake, Kan., resulting in the death of the fireman and engineman, and the injury of three passengers and two other employees. The accident was due to the breaking of one arm of a switch stand crank which permitted the switch points at a passing track to shift their position unrestricted and contrary to the indications of the switch light. The accident, in which the locomotive and all of the cars were derailed, occurred at 1:31 a. m. while the train was traveling at a speed of 55 miles per hour, a normal speed for that section of main line track. The accident occurred at the west passing track switch at Blake, on a one-degree curve to the right. The switch stand, which was of the ground-throw type, was located on the fireman's side.

The investigation immediately following the accident developed that the track approaching the switch, and the locomotive of the train, were in good condition, but that while the switch lamp was burning brightly and giving a clear indication for the main line, the switch points were set for the passing track. Further investigation revealed the broken arm of the switch stand crank and the finding of the section broken off. The broken crank arm clearly showed a fresh break to the extent of about ¾ in., while the balance of the fracture evidenced either an old break or a crack which appeared as though it might have been progressive in character. The testimony of the foreman indicated that the rail in this vicinity had been re-laid in June, 1925, at which time a new switch stand was installed. A new connecting rod had been applied at this switch about a month previous to the derailment and in the regular performance of his duties, the foreman had inspected and operated the switch at about 9 a. m. on the morning of January 13.

The report of James E. Howard, engineer physicist, who made an investigation to determine the reason for the failure of the crank arm, indicated that while the metal in the steel casting of the crank was not defective for that particular type of casting, the crank was severely corroded, showing a condition not expected to be displayed by a casting in service only seven months, particularly since the new connecting rod on the same switch, with one month's service, showed no effects of corrosive action whatever.

The weakened condition of the crank arm was evidenced by the fact that whereas the standard drawing of this part calls for a section 0.5 in. thick, the actual thickness, due to corrosion, had reduced to 0.3 in. at the point of fracture. The lug on the broken side of the crank arm was also badly corroded, having a diameter of only 1.22 in., whereas the original diameter was 1.5 in.

The conclusions reached indicate that while a normal inspection of the crank should have revealed its weakened condition, and that while a minute examination might have revealed the crack developed, the original error was presumably in having designated the crank as a new part when the switch stand was assembled about seven months prior to the derailment.

Derailment Due to Error on Part of Flagman

On April 16, 1926, a southbound passenger train on the Missouri Pacific was derailed near Gum Springs, Ark., resulting in the death of the engineman and fireman of one of the engines, and in the injury of one passenger, one person carried under contract and one employee. The accident occurred near the center of a 2 deg. curve 2,847 ft. long, north of which there is a long tangent. The track was laid with 90-lb., 33-ft. rails, with about 20 ties to the rail length, fully tie-plated, and was ballasted with about 18 in. of gravel. The general maintenance was good. The weather was clear at the time of the accident, which occurred at 10:18 a. m.

On the day of the accident the foreman arranged to replace a defective rail in the track and sent a laborer in each direction with flagging equipment, with instructions to hold all trains until recalled. The foreman stated that when sending out flagmen he usually gave them specific instructions as to the distance they should go and also said that his method of recalling them was to go within speaking distance and notify them. The flagman he used to the north on this occasion had had about 15 years experience as a section laborer and was generally used as a flagman.

After the flagman had disappeared from sight around the curve the foreman and the gang removed the defective rail and started to put in the new rail when it was found that due to expansion the new rail was too long to fill the gap. The gang then removed some of the spikes on the inside of the rail immediately south of the new rail, and springing the old rail out until the ends of the old and new rail could be brought together, began to force the rails back to gage. While thus engaged the foreman heard the exhaust of an approaching train, and looking up he saw the train approaching at a speed he estimated at about 60 miles an hour. He immediately ran towards the train giving stop signals, but the train could not be stopped before reaching the point where the work was in progress.

The section laborer sent to flag to the north stated that he had gone to the specified point and placed two torpedoes on the rail. Shortly afterward he saw the passenger train leaving the station to the north and looking southwardly he saw someone whom he thought to be the section foreman signaling for him to come in, to which he responded by signaling in the same manner. After receiving a second similar to the first he removed the two torpedoes just before the arrival of the train. The evidence indicated that the section foreman had not left his gang while the work was in progress and hence could not have been seen by the flagman and it could not be ascertained that there was any one else in the flagman's line of vision making any motions which he could have misinterpreted. The section laborer was held responsible for failure to provide proper protection while the rail was being replaced.

A Plea For More General Use of a Creosote-Coal Tar Solution

A Study of the Economic Utilization of These Materials in Wood Preservation

BY S. R. CHURCH
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THE preservative treatment of ties, poles, trestle and bridge timbers and piling with chemicals is no longer a speculation but an assured saving. The choice of preservative, broadly speaking, lies between creosote and zinc chloride. Creosote is recognized the world over as the standard and its use has become so extensive that more attention should be given to possibilities of extending the limited quantity available.

Coal tar is now produced in the United States at the rate of half a billion gallons per year although in 1913 only one-third of that amount was produced. If the production of creosote had kept pace with the production of coal tar, it would now amount to nearly 120,000,000 gal., whereas it is actually less than 50,000,000 gal.

The United States is now using all of the creosote it produces, practically all of the surplus production of Europe, and in addition about 35,000,000 gal. of coal tar, petroleum and water gas tar. These latter materials are mixed with the creosote for two reasons, viz: to get more gallons of preservatives for the same money and to increase the resistance of timber against checking and wear (especially in the case of railway cross-ties).

Before discussing the economic merits of the creosote-coal tar solution, it will be worth while to analyze briefly the underlying economic basis of creosote production. When coal tar is distilled, the distillate which comes over in the form of vapor condenses as oil, and the residue remaining in the still is pitch. The latter is soft or hard, depending on the extent to which the distillation is carried, i. e., how much oil is distilled over. The same factor governs the character of the oil, expressed as specific gravity or boiling points; the farther the distillation is carried, the heavier and higher boiling the oil becomes.

The Pitch Must Also Be Disposed Of

Although from the first fractions of this distillate are recovered such coal tar derivatives as naphthalene, phenols and cresols, the entire quantity of these refined products produced in the United States does not equal 1 per cent of the tar produced, or about 3 per cent of the tar actually distilled. The main products of tar distillation, constituting 95 per cent of the dry tar, are creosote and pitch. The yield of creosote depends, as before stated, on the grade of pitch required. If very hard pitch is made, the creosote may exceed 50 per cent of the original tar. However, the nominal yields in making commercial grades of pitch lie between 20 per cent and 40 per cent. Here we reach the heart of the question. What can be done, on an economic basis, to produce more creosote?

If tar is bought and distilled solely for making creosote and the pitch wasted or uselessly stored, the price of creosote will have to be even higher than it is now, and some of the railroads complain about the present price level. Surplus pitch cannot be absorbed in the market; it is a commodity with very limited and definite uses. Therefore, if the distillers exceed the limits of pitch outlets, they will have to get more than double the cost of the tar, plus freight, distilling costs and expenses, meaning that creosote under those conditions would cost 16 cents or more per gallon f. o. b. point of production. This surplus tar then is being burned by the producers in their steel plants; and while such burning constitutes a loss of millions of gallons of potential creosote yearly, it is, under the present conditions, the only logical way of disposing of that tar.

Bethell Laid the Foundation

When John Bethell took out his letters-patent in England in 1838 for "rendering wood, cork and other articles more durable," he laid, as historians have agreed, the foundation of the wood preserving industry that exists today. Whether Bethell was wiser than his generation, or for some other reason, he nevertheless indicated, in that patent, his belief that coal tar itself was a preservative, and he claimed its use, blended only with sufficient of the oils distilled therefrom so that the mixture would enter the wood. His own words are:

7. Any mineral tar or bitumen, or any vegetable tar mixed, when necessary to do so, with any volatile oil or spirit to thin it sufficiently to penetrate the articles on which it is to be used, and to which may be added a portion of caoutchouc or black rosin, which is incorporated therewith by heat.

8. Coal tar obtained from gas works, thinned with from one-third to one-half of its quantity with the essential oil or spirit obtained by the distillation of coal tar. That which I use is the common spirit left after the naphtha is obtained, and commonly called in the trade "dead oil."

Claims 9, 10 and 11 describe other oil formulas in which sulphur, Stockholm tar, fish oil, etc., are mixed with "dead oil." Later in this patent Bethell says "the mixtures No. 7, 8, 9, 10 and 11 are chiefly applicable to wood that is much exposed to the weather, as for railroad sleepers, piles, outdoor posts and fences, etc."

He Advocated the Use of Mixtures

None of his 18 specified formulas called for distilled creosote alone. The reasons why creosote alone came to be used in place of the original Bethell oil are not difficult to explain. It was cheap and plentiful enough; wood treated with it was cleaner and less disagreeable to handle; and scientists then, just as today, pointed out that the distillate oils contained the active poisons that would prevent decay due to fungal attack. Conditions in Europe are such that checking and mechanical wear of ties have never been serious. Hence, neither technical nor economic reasons seemed to favor the choice of Bethell's oil.

As long ago as 1908 a blend of about 80 per

cent creosote and 20 per cent filtered tar was used quite extensively in the United States for treating railroad ties. The use of this kind of oil has increased progressively since then. During the years when little or no creosote came from Europe, the "coal tar solution" naturally attracted favorable attention as a means of making the domestic oils go further.

A great deal of conservatism was exercised in adopting the coal tar solution. Some feared that the addition of tar might lessen the penetrative capacity of the oil, others that it might impair its preservative value. Experience has shown that the solution, using as much as 30 per cent of tar, offers no treating difficulties, provided that approved specifications governing materials and methods are enforced. As to preservative quality, it has already been pointed out that coal tar (and this is particularly true of the modern coke oven tar) is really more than 50 per cent creosote. This is a conservative estimate of its creosote content, since it has been found that by distillation under reduced pressure and corresponding reduction of temperature, considerably more than 60 per cent of creosote can be obtained. This oil meets the requirements of No. 1 specifications.

The Advantage of Tar

The addition of tar, although originally adopted for reasons of economy and to eke out the supplies of domestic oil, now appears to be desirable by reason of its action in reinforcing creosote. Although it is too soon to state that service has proven the superiority of the creosote-coal tar solution, there is much evidence that ties so treated check less and that the wood is more oily than in ties treated with similar amounts of creosote alone.

Apparently one effect of the tar addition is to retard evaporation of the creosote and this may be a function of increased surface tension of the oil, as well as increased boiling range. This phase of the subject might well be investigated further and tests made to determine the quantity and character of oil remaining in ties that have been in service for 14 or 15 years.

It is our present purpose to emphasize the evident economic value, rather than the possible technical advantage, of the creosote-coal tar solution. In buying creosote-coal tar solution the price is always fixed according to the proportion of tar and distillate creosote. The cost of the tar is usually not much more than one-half that of the distillate. Thus, the buyer really receives more than ½ gal. of additional creosote for each gallon of tar that is used in the solution. For example, 100 gal. of a 70-30 solution contains over 85 gal. of creosote.

About one-half of the ties now treated with oil are treated with the creosote-coal tar solution. Assuming that the average treatment injects 2½ gal. per tie, 110,000,000 gal. of oil is required to treat 42,000,000 ties, which at present is made up about as follows:

21,000,000 ties use 55,000,000 gal. of creosote-coal tar solution, of which about 40,000,000 gal. is distilled oil and 15,000,000 gal. coal tar (part 70-30 solution and part 80-20).

14,000,000 ties use 35,000,000 gal. of creosote (100 per cent distillate).

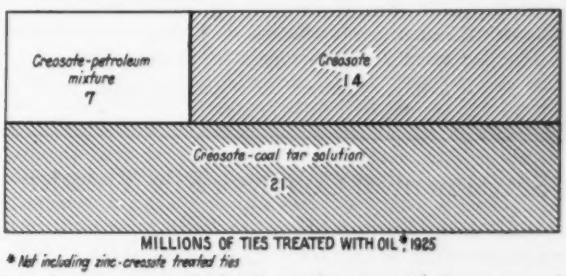
7,000,000 ties use 20,000,000 gal. of creosote-petroleum mixture (these ties received a somewhat heavier treatment than 2½ gal.) of which about 10,000,000 gal. is creosote.

This requires 85,000,000 gal. of distillate creosote, whereas if all of these could be treated with 70-30 per cent solution, the distillate creosote required would be 73,500,000 gal.; thereby releasing 11,500,000 gal. of creosote for additional treatment.

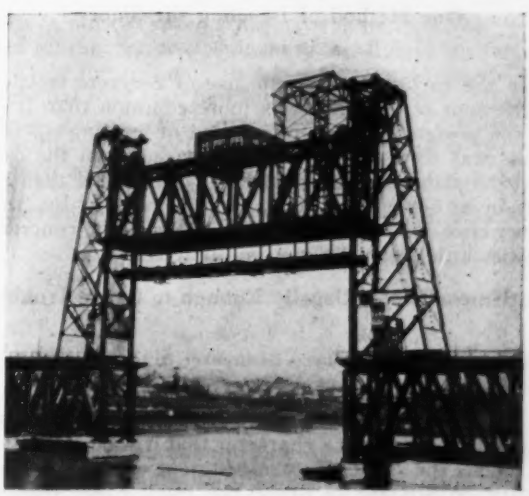
Cheaper Creosote Will Encourage Use

It should be remembered that in spite of the universal acceptance of the sound economy of tie treatment, there are still upwards of fifty million untreated ties used yearly, and that a large proportion of these would be treated if creosote was available at a reasonable price. Unfortunately, there are regions where coal tar is not available at points near enough to the treating plants to make its use economical. This is especially true with regard to plants on the southern seaboard, the Gulf coast and the Pacific coast. Wherever it is possible to obtain the creosote-coal tar solution at cost suitably lower than that of No. 1 oil, its use is definitely indicated as economical and conserving a product whose output now falls far short of meeting the country's needs.

For several months the United States has been in the novel and unpleasant position of having an unfavorable balance of trade. If the 14,000,000 ties that are now treated with distillate oil should be treated with creosote-coal tar solution, an item of $1,500,000 would be transferred from the debit to the credit side of our trade balance; of which about one-half would go for domestic purchases and the other half would remain in the pockets of the railroads.



Relative Numbers of Ties Receiving Straight Creosote and Mixture Treatments



A Vertical Lift Span in a Railroad Bridge

What's the Answer?

What Our Readers Have to Say on Current Questions That Perplex Those Engaged in Maintaining Tracks, Structures and Water Supply Facilities

QUESTIONS TO BE ANSWERED IN THE SEPTEMBER ISSUE

1. *Is a ballast fork of any use as a tamping tool?*
2. *Under what conditions is the sand-blast economical in cleaning steel bridges preparatory to repainting?*
3. *When replacing ties should they be full tamped as they are put in or should this be deferred until after all the ties for the day have been inserted?*
4. *What are the relative merits of concrete and vitrified brick for passenger station platforms?*
5. *When a flagman is sent out what method should be used in recalling him to avoid the possibility of a misunderstanding?*
6. *Can treated timber be made fire resistant cheaply?*
7. *What measures should be taken to see that the tools used by maintenance gangs are at all times in a safe and serviceable condition?*
8. *Can cracked pipes or badly leaking joints in a water main be repaired without shutting off the water?*

Settlement of Concrete Pile Trestles

What is the best method of leveling up the slabs in a concrete trestle where some of the piles have settled?

The Best Way Is Not to Have Any Settlement

By C. C. Westfall
Engineer of Bridges, Illinois Central, Chicago

We have had, to my knowledge, only two or three cases where the bents in concrete pile trestles have settled appreciably, and consequently have not determined upon any best method of correcting such a situation. The best thing is to use long enough piles and drive them to sufficient bearing that there will be no settlement and in general this is what we have been able to do.

One Method of Leveling the Slabs

By a Bridge Engineer

In the earlier days of the use of concrete trestles settlement of the piles was more common than it is at the present time. One method of leveling up the slabs was to use hard wood shims between the cap and the slab until the settlement ceased and then to put in a cement mortar joint. Profiting by the experience gained in installing the first concrete trestles little trouble is now encountered.

Settlement Is Not Usually Enough to Cause Trouble

By C. N. Bainbridge
Engineer of Design, Chicago, Milwaukee & St. Paul, Chicago

While we undoubtedly have had some settlement in some of our concrete slab trestles, the settlement has not been of such a character that it was necessary to relevel the slabs. Any adjustment which was necessary on account of lining the track could readily be taken care of by the ballast.

It is rather difficult to conceive of one or two piles in a concrete bent, as these bents are usually constructed, settling without the entire bent settling, and if the latter should occur to such an extent as to require re-setting of the slab, I would be inclined to put in a more substantial foundation.

A Day's Work in Replacing Ties

What is a reasonable output per man in replacing ties in gravel and crushed stone ballast, respectively?

Field Tests of Tie Renewal Costs

By J. M. Sills
Division Engineer, St. Louis-San Francisco, Springfield, Mo.

We have kept some very careful stop-watch data in connection with inserting ties in gravel ballast, the average of which indicates a cost of 25.3 cents per tie, for a total of 600 ties inserted, being 1.4 ties per man hour, with a total cost of $151.77. This series of checks or field tests covered 15 different sections in line with the attached detail, from which it will be noted that the costs are quite different. This difference is not due to a variation in method but generally is due to a difference in the condition of the ballast. Gravel at times becomes cemented and in one case it will be noted a very large gravel was encountered. The rather low prices were due to the fact that ties were inserted while surfacing. This charge, on account of the fact that the work was supervised by an engineer and the method was definitely lined up by him ahead of time, is a little bit lower than the average cost. Such a cost in the kind of material and under the conditions encountered would be about 27 cents.

We also have some records of inserting ties in crushed rock ballast on branch line sections, showing an average of 1.15 ties per man hour, at a cost of

31.4 cents per tie. This cost covers 12 sections and a large number of ties, with average conditions. The work was not specifically supervised, and the figures were taken from the daily cost data sheets. The figure shown would not be comparable with those shown for gravel ballast due to the fact that traffic and other conditions on the branch line were entirely different from those obtaining where the ties were inserted in gravel. The costs include the foremen's time in all cases.

Tie Insertion Tests—Gravel Ballast

Sec. No.	Number of ties inserted	Hours including foremen	Ties per man hour	Cost	Cost per tie	Remarks
13	28	21	1.33	$7.24	$.258	
14	38	20	1.90	7.45	.196	Inserted while surfacing
15	38	32	1.19	11.92	.314	
16	30	28	1.07	9.15	.302	
18	41	30	1.37	10.86	.265	
19	47	40	1.18	13.06	.278	
21	17	14	1.21	4.97	.292	
22	31	28	1.11	9.93	.323	
23	43	20	2.15	6.79	.156	Inserted while surfacing
24	98	55.5	1.76	20.25	.207	Inserted while surfacing
25	36	26.7	1.35	9.93	.276	
26	43	30	1.43	10.41	.242	Extra wide shoulder
27	19	12	1.58	4.47	.235	
28	52	32	1.63	10.86	2.09	Gravel mixed with chatt
29	39	40	0.98	14.48	.371	Very large gravel
	600	429.2	1.40	151.77	.253	

It Depends on Whether the Track Is Raised or the Ties Are Dug In

By G. S. Crites
Division Engineer, Baltimore & Ohio, Baltimore, Md.

Where adjacent tracks or narrow cuts or fills do not prevent placing the ties perpendicular to the track opposite the locations where they are to be put in, a reasonable output per man per day of 8 hours in track fully ballasted with gravel is 20 if the track is raised, or 8 if the ties are dug in. Under like conditions with stone ballast a reasonable output is 17 and 6, respectively. This includes stringing out the ties, pulling spikes, cribbing out and removing the old ties, preparing the new beds, placing the new ties, applying tie plates, driving spikes, tamping, replacing and dressing the ballast and disposing of the old ties by piling for burning.

Output Varies With Characteristics of Ballast and Class of Labor

By H. R. Clarke
General Inspector Permanent Way, Chicago, Burlington & Quincy, Chicago

It is not possible to give an answer to this question, based on the kind of ballast alone. Other features must be considered as for instance, the extent to which the track is filled in with ballast, the width of shoulder, the length of time since the track was surfaced and the ballast loosened up by a general lift and renewal, etc. The efficiency of the labor available must also be taken into account.

The Burlington has not gone to the expense of making the extensive time studies that have been made on some roads, but from time to time a record has been kept on representative sections on which various conditions of ballast dressing, etc., obtain, and it is on information secured from such reports that my answer is based. It is assumed that ties have been distributed along the track approximately where they will be put in. The work includes removing the old tie, inserting and properly tamping up the new tie, applying tie plates, spiking, filling in and dressing up the track and piling the old ties. On this basis a reasonable output per man in an eight hour day is as follows:

1. In stone ballast, of rather large size with a very heavy shoulder and where track has not been raised for a number of years, 6 ties.
2. In the same ballast as above but track surfaced about a year and dressed with a light shoulder, good native labor living along the line, 9 ties.
3. The same condition as No. 2, but with foreign or transient white labor, 8 ties.
4. In slag, very similar to stone, standard dressing with foreign or transient white labor, 8 ties.
5. In slag slightly larger in size than in No. 4, and more compacted, with the same labor, 7½ ties.
6. In crushed and washed gravel, track surfaced within two years, standard dressing, native labor, 9 ties.
7. Pit run gravel containing some large spalls, standard dressing, native labor, 8 ties.
8. Pit run gravel, rather fine and free from spalls, standard dressing, native labor, 9½ ties.

The Intelligence of the Section Men Is a Factor

By L. Flynn
Yard Foreman, Galveston, Harrisburg & San Antonio, El Paso, Tex.

The number of ties one man can put in in a day depends on a number of conditions such as the amount of traffic and the location of the work, but it also depends on the intelligence of the man. At Van Wert, Ohio, on the Cincinnati Northern, I had two men who put in 63 ties in gravel ballast in 9½ hours. At other places I have had men who would put in only 10 ties in slag or stone ballast in 7½ hours, whereas if they had been intelligent and experienced they could have put in from 15 to 18 in the same time.

Sheet Metal Fire Protection for Bridge Decks

What is the best method of fastening sheet metal fire protection to the deck of a bridge from the standpoint of ease of removal when necessary to make repairs to the bridge?

The Method Will Depend on the Design

By Supervisor of Bridges

The method of applying the sheet metal will vary somewhat with the design of the bridge but should be such as not to cause undue labor in its removal. The size of the sheets should be standardized as far as possible for economy in replacement and should be such that they may be handled easily by the ordinary bridge gang. The fastenings should be designed to hold the sheets securely to the timber and to permit of their easy removal when necessary.

Experience With This Form of Protection Has Not Been Favorable

By W. H. Peterson
Engineer Maintenance of Way, Chicago, Rock Island & Pacific, Des Moines, Iowa

We do not follow as a standard practice the use of metal fire protection on the top of our pile structures, although we have one or two bridges that are covered with second-hand corrugated car roofing. We had a fire on one of these recently, and the sheet iron covering prevented us from getting quick action upon the fire. The bridge had a highway underneath and was steel construction, but the fire had

gotten beyond control of the men before being discovered, and hence I do not believe that any type of protection that we might have had on the upper structure would have made any material difference.

A Satisfactory Method

By G. A. Haggander

Bridge Engineer, Chicago, Burlington & Quincy, Chicago

A separate strip of iron 12 in. wide should be used under each rail. On the outside of each rail a piece 16 in. wide is used, turning up against the timber fender and lapped over the piece under the rail. Between the rails two pieces are used, each 28 in. wide, one edge lapping at the center of the bridge and the other lapping over the piece under the rail. All edges are nailed with 8d 2½ in. No. 9 fence nails fully barbed with 9/16 in. cut washers under the head. Five longitudinal strips of metal are thus used and the entire deck, except a portion under the rails, can be uncovered without disturbing traffic.

Copper or Iron Screens for Railroad Buildings?

What are the relative economies of copper and iron wire screens for railroad buildings?

Copper Screens Should Be Used in Damp Climates

By J. F. Lake

Roadmaster's Clerk, Southern Pacific, Beaumont, Tex.

It is economical to use copper screens in territory where the climate is damp as iron screens will only last from one to two years while copper screens will last from three to five years and the labor saved in installing the screen will more than offset the difference in the cost of material.

Iron screens are more economical in dry climates since they will last practically as long as the copper screens in such locations. The copper wire is much easier torn than the iron wire and if not given close care will be torn to such an extent that they will have to be renewed before they rust out.

Adjusting Spirals to Speed

Spiral curves are preferably of such length as to coincide with the run-off for the superelevation of the curve. If for any reason a material change is made in the superelevation of the curve should the spirals be changed where the speeds do not exceed 55 or 60 miles per hour?

Not Necessary for Speeds Less Than 60 Miles Per Hour

By Engineer Maintenance of Way

While it is desirable that the length of the run-off and the spiral should be of the same length it will usually be found unnecessary to change the spirals for speeds not exceeding 60 miles per hour. If the superelevation is increased it will mean extending the run-off beyond the point of spiral onto the tangent and while this is not theorectically correct it will usually cause little trouble.

The writer has in mind a division of single-track railroad where freight train speeds were about 30 miles per hour and the speed of the fast passenger trains was about 55 to 60 miles per hour. The grade line was comparatively level so that the fluctuations in speed between stations were small. On this line, a superelevation of ½ in. per deg. had been used, with a maximum of 4 in. and the length of spirals was based on a run-off of ½ in. to a 30-ft. rail. This rate of superelevation being insufficient for the fast trains it was changed to 1½ in. for a one-degree curve with progressively lighter rates per degree for sharper curves, with a maximum of 5 in. None of the spirals was changed at first and experience showed it was unnecessary to change them except in a few instances where special conditions prevailed.

Drainage of Railroad Crossings

What can be done to improve conditions under railroad crossings where opportunity for natural drainage is lacking?

Reinforced Concrete Slabs Under the Crossing Afford a Firm Foundation

By Roadmaster

Concrete slabs have been used successfully as foundations for crossings subject to heavy traffic and are also of advantage where drainage facilities are lacking. In the latter case the slab should be placed on a layer of crushed stone or cinders of sufficient thickness to insure its being kept out of the mud. The expenditure that may be made economically to eliminate the bad effects of improper drainage will depend on the amount of traffic carried by the crossing and the extent to which the life of the crossing is shortened by reason of poor drainage. A thorough study of the location and its surroundings will sometimes disclose a method of draining that at first glance would appear impracticable.

Methods for Overcoming Poor Drainage at Railroad Crossings

By E. D. Swift

Engineer Maintenance of Way, Belt Railway of Chicago, Chicago

As far as available distances in levels are concerned the opportunity for drainage at the average crossing site is probably not less than at other track locations and it must therefore follow that when inferior drainage exists at crossings it must as a rule result from obstructions to the flow of water within the crossing area rather than from lack of fall to carry the water away. The endeavor should be to limit the water coming within the crossing area to that which falls on it, to shed as much of it as possible from the surface, and to provide a ballast bed and such drains as will cause a minimum of obstruction to its flow to the outside, for the water that penetrates the roadbed. Due to two-line traffic and to the jolting action given locomotives and cars by the crossing intersections, the deposits of sand, cinders, coal dust and other ballast-fouling matter accumulate much faster at crossing sites than in adjacent track.

The drainage provisions at crossings must be more thorough than for other track for the maintenance of comparable conditions, and the reconditioning of drainage facilities must be comparatively frequent due to their rapid deterioration. The following are some provision that have been found to be effective in draining crossings: A deep bed of crushed rock or slag ballast, the sub-ballast to be relatively coarse and the top ballast relatively fine as compared to ordinary sizes; the use of French drains, that is to say trenches back-filled with coarse broken stone, brickbats, etc. These drains should

be at least two feet deep. They should undercut the crossings and their outer ends should lead to lower ground; the embankment shoulders to be not higher than the ballast bed in the crossings and to slope to the outside; the surface of the roadbed to be carefully dressed to aid quick shedding of the water; roadbeds and embankments to be cross drained outside of and up grade from the crossings in cases of grades descending to the crossing, and comparatively frequent reconditioning or renewal of ballast and other drainage provisions.

Single-Acting and Double-Acting Track Jacks

What are the relative merits of single-acting and double-acting track jacks?

A Further Answer to an Old Question

By R. T. Tobien
Engineer Maintenance of Way, Southern, Birmingham, Ala.

In my opinion, the single-acting jack is ordinarily preferable as the upward movement of the double-acting lever under heavy load presents a possibility of personal injury when the movement is not completed, or when the parts become so worn that the jack kicks out when the downward stroke is made. In favor of the double-acting jack is the fact that it is convenient because of being more easily worked. Our men are favorable to both types but my personal preference is for the single-acting jack.

Locating Underground Water Supplies

Are there any devices which will indicate underground water supplies?

No Reliable Device Is Known

By C. R. Knowles
Superintendent of Water Service, Illinois Central, Chicago

I have never used an instrument of any kind for the purpose of locating underground water supplies. The use of a forked twig in locating underground water supplies is quite common in certain rural districts but I do not think that it is considered very seriously by experienced well drillers. This method of locating water or other mineral by means of a forked twig or divining rod has evidently been handed down by superstitions of the Middle Ages when the process was used for the purpose of finding hidden treasure and also for detecting criminals. A large number of more complicated devices have been designed for locating water and other minerals, all of these devices being closely related to the forked twig.

The United States Geological Survey at Washington has received innumerable inquiries as to the merits of various machines and instruments devised for locating underground water or other minerals. In each case they have advised against the expenditure of money for the use or purchase of these machines or instruments, or the services of the so-called water witches. There are at least 24 patents on water finders now on file in the United States Patent Office, with probably a greater number that have been rejected. Most of the present devices are magnetic or electrical instruments and range from ordinary dip needles to telephones and devices using wireless waves. While it is possible that underground streams or bodies of water might be detected by one of these instruments in a very arid region where the ground is dry and where the instrument might not be influenced by moisture in the earth, I do not think it would be of much value for general purposes.

On Which Side Should the Switch Stand Be Placed?

Should switch stands for main track turnouts be placed on the frog side of the track or should they always be placed on the engineman's side for trains facing the switch?

No Hard and Fast Rule Can Be Made

By R. B. Robinson
Engineer Maintenance of Way, Union Pacific, Omaha, Neb.

My views are that no hard and fast rule can be made to cover this question. Our rules, which express my ideas on the matter, provide that main track switch stands shall be placed on the turnout side of the track, as far as possible except that when necessary for safety or other good reasons switch stands for crossovers may be placed on the opposite side. In yards and terminals, switch stands may be placed on either side of the track, especial attention being given to the convenience of switchmen and trainmen and to reducing the hazard of accident. Switch stands for the live rail tracks over scales should be placed on the same side of the track as the scale box or house.

In case two or more switches are located so that their targets or switch lamps might be confused, special arrangements should be made to meet the requirements, such as using switch stands of different heights, or setting one stand further from the track than standard by the use of longer connecting rod.

The Stand Should Be Placed on the Turnout Side

By J. F. Deimling
Chief Engineer, Michigan Central, Detroit, Mich.

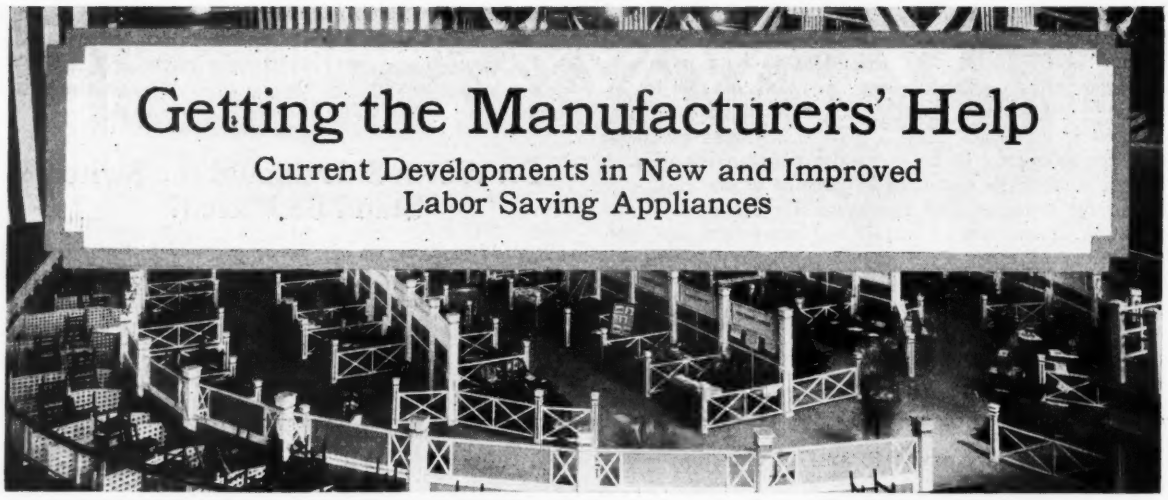
It is our practice to locate the switch stand on a main track turnout so that there will be a pull on the switch points, as we believe that this arrangement, in a large measure, prevents the switch point from opening up in the event that the switch should be damaged by dragging equipment, etc.

We do not believe that there is very much to be gained in an attempt to locate the switch stand so that it would be on the engineman's side when facing the switch. It is desirable to have it so if it is possible, but I think the other angle is far more important.

The Frog Side Is Preferred

By L. Flynn
Yard Foreman, Galveston, Harrisburg & San Antonio, El Paso, Tex.

When possible, I prefer the switch stand on the frog side for main track turnouts as I have known of accidents being caused from dragging equipment catching the switch rods and pulling the point away from the stock rail when the switch stand was set on the opposite side. On account of curves or other obstructions to the view it is sometimes best to set the switch stand on the side opposite the frog but this always introduces a certain hazard but in most cases the engineman, if he is on the lookout, can see the target long before he approaches the switch, no matter on which side it is located.



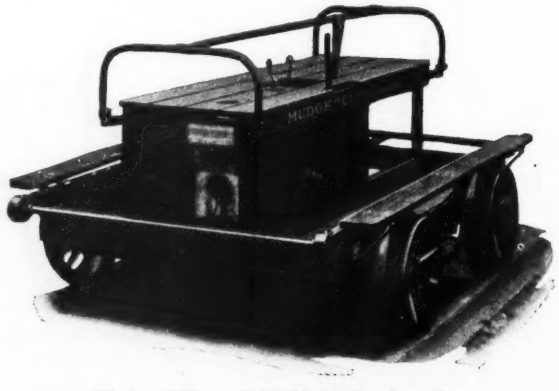
Getting the Manufacturers' Help

Current Developments in New and Improved Labor Saving Appliances

A New Light Section Car

TO MEET the demand for a light weight section motor car for the use of small maintenance gangs, Mudge & Company, Chicago, have recently placed on the market their new "Class A-1" light section motor car, which can be handled easily by two men, yet which is large enough to accommodate six men and the ordinary section gang tools.

The new car is equipped with a four horsepower, free running motor similar in construction to the Mudge type W motor used in the Class WS-2 "Standard Section" and WS-3 "Heavy Duty" motor



Mudge "Class A-1" Light Section Car

cars. The transmission is accomplished by means of a belt. The motor is water-cooled by the Mudge thermo-syphonic water hopper which, it is claimed, permits three times the ordinary cruising radius and eliminates excessive heating of the engine. The crank shaft of the engine and the axles are mounted in roller bearings. The car weighs 690 lb. and provides power and capacity ample for small gang service. The lifting weight of the car is 140 lb.

The car is equipped with self-equalizing, quick-acting, four-wheel brakes, which do not require manual adjustment for wear, the brakes adjusting themselves automatically so that braking pressure is always the same on each wheel. The car is also equipped with a unique locking device so that when the brakes are set, they hold. When the operator steps aside to do his work, he need only pull back the brake lever and place it in the notch provided, locking the brakes securely and preventing the car from moving. The frame of the car is made of tough oak which supplies sufficient flexibility to withstand twisting in service. Skids to facilitate removal of the car from track are standard equipment.

A New Center Load One-Man Motor Car

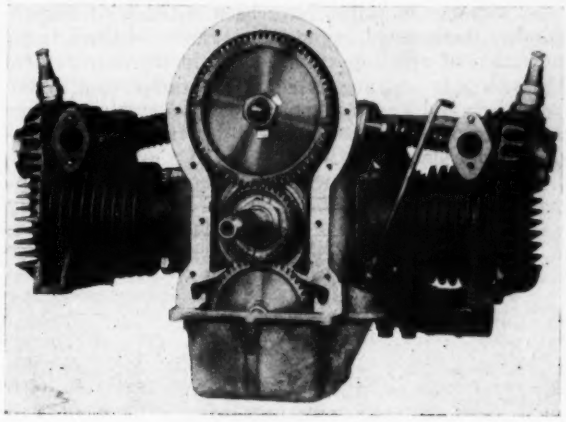
THE Buda Company, Chicago, has placed on the market a new center load motor car which it calls the Buda Trackster No. 419 and which is designed as a safe light car which can be handled easily by one man. The frame is built up of automobile type channel steel of four-inch depth, hot riveted and strengthened with gusset plates. In assembling the car the brakes and all other mechanism except

The Center Load Motor Car

the axle sprocket are placed above the bottom of the frame, thus preventing fouling the rails when removing the car from the track. In case of derailment the frame acts as a skid and the car slides along the rail until it comes to a stop, without injury to any of its parts. Large one-piece axles and 14½-in. wood center wheels are used. The axle bearings are

of the roller type, specially designed to counteract side thrust, and are held in mountings of compressed live rubber which not only contribute to easy riding qualities but also prevent friction losses by making the bearings self-aligning.

The engine is mounted above the floor of the car, immediately ahead of the seat and is protected by a removable hood, thus making it easily accessible. It is air-cooled, of the two-cylinder, four-cycle, horizontally opposed type, with a counterbalanced crankshaft mounted in ball bearings. The engine is free-running, a simple plate clutch of large size providing transmission to the sprocket chain which drives the rear axle. A rope starter is provided to obviate the inconvenience of pushing the car to start the engine. The engine, which is said to be of



The Engine with the Gear Case Cover Removed

ample power and to run with great smoothness, may be made reversible if desired. Ignition is provided by a high tension fly wheel magneto

Celite Simplifies Pneumatic Work

WITH ITS many miles of tunnels, one of the important programs of work on the Southern Pacific is the re-lining of its timber-lined tunnels with concrete. In recent years this work has been greatly facilitated, and at a considerable saving, by the use of the pneumatic system of conveying or distributing concrete from the mixture to the points desired, and also for placing the concrete in places difficult to reach with ordinary methods.

While this system of placing concrete has worked to large advantage, it has had one particularly objectionable feature, namely, the short life of the bends in the conveying pipe owing to the severe pounding and friction to which they are subjected by the rapidly moving masses of concrete. In some cases their elbows have worn through in five operating days. This difficulty was overcome, to a large extent, by introducing into the mix a quantity of Celite, a product manufactured by the Celite Products Company, Los Angeles, Cal. On the addition of five pounds of this material to the bag of cement it was found that the friction in these pipe bends was so reduced that their life was extended from 5 to 25 operating days in some instances.

The reason for the reduction of the friction in the pipe bends caused by the admixture, is attributed to the particular characteristic of Celite (diatomaceous silica), which has a tendency to increase both the workability and the plasticity of the mix.

With the Associations

The Wood Preservers' Association

The members of the executive committee of the American Wood Preservers' Association and the Committee on Wood Preservation of the American Railway Engineering Association held their summer meetings at Boston, Mass., on June 23 and 24, joining in a dinner on the evening of June 23 at which approximately 30 were present. The sessions on the first day were devoted to the routine work of these organizations while the second day was spent in an investigation of a new preservative material which is now being developed at a point near Boston.

The Metropolitan Track Supervisors Club

The Metropolitan Track Supervisors Club of New York held its fifth annual meeting and outing at the Hotel Nassau, Long Beach, Long Island, on June 23. A special train was provided by the Long Island Railroad, which railroad also provided entertainment. P. H. Woodward, general passenger agent of the Long Island, was the speaker of the occasion. A total of 220 members and members of their families were in attendance.

At the annual meeting which was held in connection with this outing, the following officers were elected for the ensuing year: President, W. A. Clark, supervisor, Reading, Trenton Junction, N. J.; first vice-president, John Sheehan, supervisor, L. V., Jersey City, N. J.; second vice-presirent, F. J. Meyer, assistant engineer, N. Y., O. & W., Middletown, N. Y.; secretary-treasurer, W. C. Kidd, Ramapo-Ajax Corporation, Hillburn, N. Y.; assistant secretary-treasurer, L. S. Walker, P. & M. Company, New York City.

The following were elected members of the executive committee: Chairman, R. B. Harris, supervisor, Penna., Baltimore, Md.; E. F. Garwood, secretary to general superintendent, L. I., New York City; J. M. O'Connell, supervisor, N. Y., N. H. & H., New Haven, Conn.; G. L. Dunn, supervisor, Erie, Port Jarvis, N. J., and N. E. Brooks, Wyoming Shovel Works, New York City.

The Roadmasters' Association

Members of the executive committee and chairmen of committees met at Chicago on June 25 to review the reports of the committees and plan the program for the next annual convention which will be held in Chicago on September 21-23. Four of the five reports that are being prepared were reviewed and suggestions made for their prompt completion.

The applications which the Track Supply Association has already received for exhibit space in connection with the Roadmasters' Association indicate that the demand will exceed the space available in the

Auditorium Hotel, more than 47 firms having already made requests with many others still to be heard from. Those applying for space to June 28 include the following.

American Chain Company, Inc.
American Hoist & Derrick Co.
American Steel & Wire Co.
American Valve & Meter Co.
Bethlehem Steel Company.
Buda Company.
Chicago Malleable Castings Company.
Cleveland Railroad Supply Company.
Crerar, Adams & Co.
Duff Manufacturing Company.
Fairbanks, Morse & Co.
Fairmont Railway Motors, Inc.
Fleming & Son Co., J. R.
Hayes Track Appliance Company.
Hubbard & Co.
Ingersoll-Rand Company.
Jordan Company, O. F.
Kalamazoo Railway Supply Company.
Lundie Engineering Corporation.
Maintenance Equipment Company.
Mechanical Manufacturing Company.
Morden Frog & Crossing Works.
Mudge & Co.
National Lock Washer Company.
National Malleable & Steel Castings Co.
Northwestern Motor Company.
Oxweld Railroad Service Company.
P. & M. Company.
Pettibone Mulliken Company.
Pocket List of Railroad Officials.
Positive Rail Anchor Company.
Q. & C. Company.
Rail Joint Company.
Railroad Supply Company.
Railway Engineering and Maintenance.
Ramapo Ajax Corporation.
Reade Manufacturing Company.
Reliance Manufacturing Company.
St. Louis Frog & Switch Co.
Sellers Manufacturing Company.
Shelton Shovel Company, Inc.
Templeton, Kenly & Co., Ltd.
Union Switch & Signal Co.
Verona Tool Works.
Warren Tool & Forge Co.
Woolery Machine Company.
Wyoming Shovel Works.

The Bridge and Building Association

The members of the executive committee met in Chicago on June 5 to plan for the Richmond convention. Advice was received from the technical committees indicating that their work was well in hand and that the reports would be completed by August 1. Arrangements were made to supplement these reports by addresses from prominent railway officers.

Directory of Associations

American Railway Bridge and Building Association.—C. A. Lichty, secretary, 319 North Waller avenue, Chicago. Next convention, October 12-14, 1926, Richmond, Va.

American Railway Engineering Association (Works in co-operation with the American Railway Association, Division IV).—E. H. Fritch, secretary, 431 South Dearborn street, Chicago. Next convention, Congress Hotel, Chicago, March 8-10, 1927.

American Wood Preservers' Association.—E. J. Stocking, secretary, 111 West Washington street, Chicago. Next convention, January 26-28, 1927, Nashville, Tenn.

Bridge Building Supply Men's Association.—B. J. Wilson, secretary, Pocket List of Railroad Officials, 605 Fischer Building, Chicago. Annual exhibit at convention of American Railway Bridge and Building Association.

National Association of Railroad Tie Producers.—E. A. Morse, secretary, Potosi Tie & Lumber Company, St. Louis, Mo. Next convention January 28-29, 1927, Nashville, Tenn.

National Railway Appliances Association.—C. W. Kelly, secretary, Seeberger Building, 845 South Wabash avenue, Chicago. Annual exhibition March 7-10 during convention of American Railway Engineering Association.

Roadmasters' and Maintenance of Way Association.—T. F. Donahoe, secretary, 428 Mansion street, Pittsburgh, Pa. Next convention, September 21-23, 1926, Chicago.

Track Supply Association.—W. C. Kidd, secretary, Ramapo-Ajax Corporation, Hillburn, N. Y. Annual Exhibit at convention of Roadmasters' and Maintenance of Way Association.

The Material Market

THE MOST important incident in the iron and steel market during the course of the past month was the announcement by certain manufacturers of an advance of $2 per ton in the prices of steel bars and structural shapes applicable to all business in the third quarter of 1926. It is understood that purchasers in large quantities have had no difficulty in placing orders at the old prices and that consumers who have contracts on the books of the manufacturers are making full specifications against these contracts which, of course, were at the old prices. In view of this it is difficult to determine whether the advance will become a real one or not.

No changes in prices have been noted with respect to other items listed in the table below and there is no indication of any important change in the near future. The railroads continue to comprise an important factor in the iron and steel market, not only because of current purchases of cars which create a demand for structural shapes and plates, but also because of a number of new orders for rails and some large orders for track fastenings.

PRICES PER 100 LBS.

	May		June	
	Pittsburgh	Chicago	Pittsburgh	Chicago
Track spikes		$ 2.90 to $ 3.00		$2.90 to $3.00
Track bolts		3.90 to 4.00		3.90 to 4.00
Angle bars	$2.75	2.75	$2.75	2.75
Tie plates, steel	$2.25 to 2.35	2.25	2.35	2.35
Boat spikes	3.25	3.25	3.25	3.25
Plain wire	2.50	2.55	2.50	2.55
Wire nails, keg	2.65	2.70	2.65	2.70
Barb wire, galv.	3.35	3.40	3.35	3.40
C.I. pipe, 6 in. 12 in., ton		49.20 to 50.20		49.20 to 49.70
Plates	1.85 to 1.90	2.10	1.90	2.10 to 2.20
Shapes	1.90	2.10	1.90 to 2.00	2.10 to 2.20
Bars, soft steel	2.00	2.10	2.00 to 2.10	2.10 to 2.20
Rivets, struct.	2.50 to 2.60	2.75	2.50 to 2.60	2.75
Conc. bars, billet	2.00		2.00 to 2.10	
Conc. bars, rail	1.80 to 1.90	2.00	1.80 to 1.90	2.00
Rail, per gross ton, f.o.b. mills		43.00		43.00

The scrap market has continued to fall during the past month and prices have become so low that there is little prospect of further depression. Rather, it will result in the withdrawal of scrap from the market.

PER GROSS TON

	May	June
Relaying rails	$26.00 to $31.00	$26.00 to $31.00
Rails for rerolling	15.50 to 16.00	15.00 to 15.50
Rails less than 3 ft. long	16.50 to 17.00	16.50 to 16.50
Frogs and switches cut apart	13.75 to 14.25	13.50 to 14.00
Steel angle bars	14.50 to 15.00	14.50 to 15.00

The lumber market is exceedingly quiet and prices show a continued downward trend, although this is moderate, owing to a decrease in production which is particularly marked on the west coast.

SOUTHERN PINE MILL PRICES

	May	June
Flooring, 1x4, B and B flat	$47.39	$46.37
Boards, 1x8, No. 1	36.48	35.35
Dimension, 2x4, 16, No. 1, common	26.80	27.41
Dimensions, 2x10, No. 1, common	29.32	30.56
Timbers, 4x4 to 8x8, No. 1	29.92	28.05
Timbers, 3x12 to 12x12, rough	42.35	39.46

DOUGLAS FIR MILL PRICES

Flooring, 1x4, No. 2, clear, flat	$27.00	$27.00
Boards, 1x8, 6 to 20, No. 1, common	16.00	16.00
Dimension, 2x4, No. 1, common	17.00	17.00
Dimension, 2x10, 16, No. 1, common	16.50	17.00
Timbers, 6x6 to 8x8, No. 1	21.00	20.00
Timbers, 3x12 to 12x12, rough	16.00	18.00

No changes have been noted in the prices of Portland cement, with the exception of Montreal, where there has been a reduction of 27 cents. The prices given in the table below are per barrel for carload lots, not including package.

New York	$2.15	Minneapolis	$2.32
Pittsburgh	2.09	Denver	2.85
New Orleans	2.30	Dallas	2.05
Chicago	2.10	San Francisco	2.31
Cincinnati	2.37	Montreal	1.15

Railway News Briefly Told

Steel ties were manufactured in America in 1925 to a total of 13,826 gross tons, according to statistics issued by the American Iron and Steel Institute. This compares with 14,968 tons in 1924 and 20,167 tons in 1923.

The shipment of cantaloupes from the Imperial Valley began on May 13, more than two weeks ahead of the usual season, and 114 cars were shipped on the first day. It is estimated that the total shipments this season will amount to 17,000 carloads.

The Georgia Court of Appeals has held that a three-year-old child, injured while playing on a pile of cross-ties belonging to a railroad and on its right-of-way, cannot recover on the theory that the cross-ties were an "attractive nuisance" under the doctrine of the "turntable cases."

The Supreme Court of the United States has held that an experienced section foreman who was killed by being struck by a train while going to his work on a railway velocipede, which he used when inspecting the track, must be assumed to have taken the risk, on the grounds that if he had been on duty he would have been held to have assumed the risk and that the permission to use the velocipede in going to his work did not make the company's obligation to the deceased greater than it would have been after he had started his work.

The Railroad Labor Board, which passed out of existence with the adoption of the Watson-Parker bill which recently became a law, has remanded to the parties in interest all pending disputes, including the applications for wage increases by the Brotherhood of Maintenance Employees affecting 31 roads. This case was heard last October but decision had not been rendered. L. M. Parker, former secretary of the Labor Board, has been appointed custodian of the records of the board and is in charge of closing up its affairs.

The Fairchild & Northeastern has been authorized by the Interstate Commerce Commission to abandon as to interstate and foreign traffic its entire line from Cleghorn, Wis., to Owen, a distance of 65 miles, traversing territory which is served by other railroads. The commission sustained the view of the Railroad Commission of Wisconsin that the Interstate Commerce Commission had no jurisdiction to authorize the abandonment of any portion of the carrier's line as to the intrastate commerce, since its entire railroad is located wholly within a single state.

The Interstate Commerce Commission, by an order issued on June 9, has authorized the abandonment of the Saratoga & Encampment as to interstate and foreign commerce. The line extends from a connection with the Union Pacific at Walcott, Wyo., to Carbon county, a distance of 44.77 miles. The owner, the Morse Brothers Machinery & Supply Company, is directed by the commission's order to sell the line, or any portion of it at a fair junk value to any one desiring to purchase it within the next 120 days. Proceedings for the abandonment of the road have been pending since 1921, in which year the Union Pacific agreed to operate the line for a period of three years, with an option to purchase it. The option was not exercised and the Union Pacific ceased operating it October 31, 1924, since which time it has been operated by a receiver.

The Baltimore & Ohio has recently equipped a number of its day coaches in passenger service between New York and Washington, D. C., with individual seats somewhat resembling the de luxe type bus seats. The seats are placed in pairs on each side of the central aisle and covered with velour with a harmonious combination of dark and light brown stripes. Special attention has been given to the construction of the seats to insure the comfort of the occupants. The window shades and the aisle carpet runner are made in shades to harmonize with the coverings of the seats.

What is believed to be a world record for a non-stop trip by a tonnage freight train was made on May 3, when a train on the Missouri Pacific made the 162-mile run from Kansas City, Mo., to Jefferson City in 5 hr. 55 min., without a stop in the entire distance. The train which was made up of 57 loads, 2,455 tons, and which averaged 27.4 miles per hour, was hauled by Engine 1498, a stoker-fired coal-burning locomotive. An auxiliary tank holding 10,000 gal. of water was provided to avoid stopping for water while one tank of coal was sufficient for the entire trip.

President Coolidge has nominated the five members of the Board of Meditation provided for in the recently adopted railway labor act, as follows: Edwin P. Morrow, of Kentucky, a member of the old Railroad Labor Board, for a term of four years; G. W. W. Hangar, also a member of the old Railroad Labor Board, for a term of two years; Samuel E. Winslow, a former representative in Congress from Massachusetts, who was chairman of the House Committee on interstate and foreign commerce, for a term of five years; Hywel Davies, a conciliator in the Department of Labor, for a term of one year, and Carl Williams of Oklahoma, who has been editor of the Oklahoma Farmer-Stockman, for a term of three years.

L. G. Bentley, chairman of the Committee on Education of the Safety Section of the American Railway Association, has issued Circular No. 127, which contains the program to be followed in the month of July in the general campaign to reduce by 35 per cent, before the year 1931, the total number of casualties to railroad employees, as compared with 1924. The circular deals with the selection and training of new employees, with the necessity of rules, and hints at the method of dealing with violations of the rules. The following points are set forth as the qualifications which should be sought in a foreman when promotions are to be made:

(1) A conscientious desire for a safe administration.
(2) Ability to win the regard and respect of subordinates.
(3) Knowledge of the business to be supervised.
(4) Ability to systematize.
(5) Vision for development.

At a hearing on June 5 before the House Committee on interstate and foreign commerce on the Parker railroad consolidation bill, Commissioner Henry C. Hall of the Interstate Commerce Commission presented the report of the legislative committee, signed by Commissioner John J. Esch. The report stated that, subject to some comments and some detail suggestions, the committee was unanimous in approval of the bill and in the hope that it may be passed, thereby relieving the commission from the requirements of the existing law that it prepare a complete plan of consolidation. It is not expected that any action will be taken on the bill during the present session of Congress, but the hearings are being held as the foundation for possible action at the next session.

Personal Mention

General

J. Davis, division engineer on the Missouri Pacific, with headquarters at Little Rock, Ark., has been promoted to assistant superintendent, with the same headquarters.

Edward H. Lee, vice-president and chief engineer of the Chicago & Western Indiana, has been elected president succeeding the late H. G. Hetzler and will continue his duties as chief engineer. Mr. Lee was born on January 29, 1863, at Dayton, Ohio, and was educated at the Ohio State University and the University of Wooster. He entered railroad service in 1880 as a rodman on the Scioto Valley (now a part of the Norfolk & Western) and subsequently served as instrumentman, assistant engineer, and resident engineer on the New York, Chicago & St. Louis, the Wisconsin Central (now a part of the Minneapolis, St. Paul & Sault Ste. Marie) and the Union Pacific until 1887, when he became office engineer of the Elgin, Joliet & Eastern, being promoted to chief engineer in 1889, and continuing in that capacity until 1893, when he engaged in private practice as engineer and superintendent for contraction, and in charge of field work for the Sanitary District of Chicago, until 1897. In 1898, he was principal assistant engineer on the joint track elevation and depression at Sixteenth street, Chicago. From 1898 to 1905, he was engineer and roadmaster on the Chicago & Western Indiana and the Belt Railway of Chicago, being promoted to chief engineer in the latter year. He was elected vice-president of these roads on March 3, 1914, continuing his duties as chief engineer and occupied these positions until his recent election as president, except during the period of federal control when he served as president.

Edward H. Lee

W. C. Hurst, whose election to senior vice-president of the Chicago & Illinois Midland which has leased the Springfield, Havana & Peoria, was noted in the May issue, was born on June 27, 1877, at Durham, England. He entered railroad service in April, 1890, as a water boy on the Chicago, Burlington & Quincy, after which he was successively track laborer, yard clerk, rodman, assistant engineer, and engineer on construction on the same road. In July, 1903, he was made assistant superintendent on the Missouri Pacific, with headquarters at Chester, Ill. From June, 1905, to October of the same year, he was engaged in special work in the office of the general manager of the Ann Arbor and the Detroit, Toledo & Ironton, with headquarters at Toledo, Ohio, and from October, 1905, to October, 1906, he was superintendent of the latter road with headquarters at Springfield, Ohio. From October, 1906, to January, 1908, he was trainmaster on the Pere Marquette, with headquarters at Traverse City, Mich., being promoted to chief clerk to the president and general manager, with headquarters at Detroit, Mich., in which capacity he served until May 1910, when he became superintendent on the Cincinnati, Hamilton & Dayton (now a part of the Baltimore & Ohio), with headquarters at Dayton, Ohio. During April and May, 1912, Mr. Hurst was engaged in special work in the office of the assistant general manager of the Pere Marquette, with headquarters at Detroit. From June, 1912, to August, 1913, he was general superintendent of the Chicago, Peoria & St. Louis, with headquarters at Springfield, Ill., returning to the Pere Marquette on the latter date to become general superintendent at Saginaw, Mich., where he remained until January 1, 1914, when he was elected vice-president and general manager of the Chicago, Peoria & St. Louis, with headquarters at Springfield, Ill. During the period of Federal control he was general superintendent of the Chicago & Alton and the Chicago, Peoria & St. Louis, returning to the latter road on February 1, 1920, as president of the corporation and general manager for the receivers, in which capacity he was serving at the time of his recent election.

J. O. Hackenberg, superintendent of the Philadelphia Terminal division of the Pennsylvania, with headquarters at West Philadelphia, Pa., and a former engineering officer, has been promoted to general superintendent, with the same headquarters. Mr. Hackenberg was born on February 25, 1878, at Milton, Pa., and graduated from Bucknell University. He entered railway service as a rodman on the Pennsylvania at Cresson, Pa., and a year later was transferred to the chief engineer's department as a levelman on track elevation on the Monongahela division. He was promoted to transitman in the principal assistant engineer's office at Altoona on May 15, 1902, and on March 1, 1903, was promoted to assistant supervisor at Millersburg, Pa., later being transferred to the main line. He was promoted to supervisor on September 1, 1905, and served in this capacity on the Allegheny, Baltimore and Pittsburgh divisions, successively. Mr. Hackenberg was promoted to division engineer of the Allegheny division, with headquarters at Oil City, Pa., on April 15, 1917, and later was transferred to the Maryland division, being promoted to principal assistant engineer of the Southern division, with headquarters at Wilmington, Del., on October 20, 1919. In March, 1920, he was appointed superintendent of the Schuylkill division, with headquarters at Reading, Pa., being transferred to the Buffalo division with headquarters at Buffalo, N. Y., in January, 1922, and to the Philadelphia Terminal division in October, 1923, where he was located at the time of his recent promotion.

J. O. Hackenberg

Engineering

J. P. Jacobs, assistant engineer on the Illinois Central, with headquarters at Chicago, has been transferred to Carbondale, Ill., succeeding **C. I. Van Arsdalen,** whose promotion to supervisor is noted elsewhere in this issue.

W. F. Murray, assistant division engineer on the Missouri Pacific, with headquarters at Hoisington, Kan., has been promoted to division engineer with headquarters at Coffeyville, Kan., succeeding **H. B. Knecht,** who has been transferred to Little Rock, Ark., to succeed **J. Davis,** whose promotion to assistant superintendent is noted elsewhere in this issue. **G. S. Smith,** assistant engineer with headquarters at St. Louis, Mo., has been promoted to assistant division engineer with headquarters at Hoisington, Kan., to succeed Mr. Murray.

W. T. Covert, engineer maintenance of way of the Western Pennsylvania division of the Pennsylvania, with headquarters at Pittsburgh, Pa., has been promoted to chief engineer maintenance of way of the Eastern Region with headquarters at Philadelphia, Pa., succeeding **W. G. Coughlin,** who has been assigned to special duties in the office of the general manager, with the same headquarters. **H. C. Johnson,** division engineer, with headquarters at Cincinnati, Ohio, has been promoted to engineer maintenance of way with headquarters at Cleveland, Ohio, succeeding **A. L. Church,** who has been transferred to Pittsburgh, Pa., to succeed Mr. Covert. **A. W. Duke,** supervisor, with headquarters at Downington, Pa., has been promoted to division engineer, with headquarters at Cincinnati, Ohio, to succeed Mr. Johnson.

Mr Covert was born on January 4, 1873, at Philadelphia, Pa., and graduated from Cooper Institute at New York. He entered railway service in May, 1890, as a clerk in the accounting department of the Pennsylvania and later became a rodman, serving in this and other capacities in engineering work on construction until October 3, 1895, at which time he was promoted to transitman in the office of the principal assistant engineer at Altoona, Pa. He was promoted to assistant supervisor in June, 1897, and to supervisor in July, 1900, and was successively supervisor, assistant engineer and division engineer on various divisions to October 25, 1917, when he was promoted to principal assistant engineer with headquarters at Pittsburgh, Pa. On March 1, 1920, Mr. Covert was promoted to engineer maintenance of way of the Western Pennsylvania division, which position he was holding at the time of his recent promotion.

W. T. Covert

C. E. Weaver, engineer, maintenance of way of the Central of Georgia, with headquarters at Savannah, Ga., has been promoted to chief engineer, succeeding **C. K. Lawrence**, who has retired. Mr. Weaver was born on January 7, 1877, at Newark, N. J., and graduated from Yale University in 1899, entering railway service on July 11 of the same year as assistant engineer on the Mexican International. In April, 1906, he became resident engineer on the Sonora Ry., and from January, 1908 to February, 1909, was also resident engineer of the Cananea, Yaqui River & Pacific, being promoted to engineer maintenance of way on the Sonora Ry., and the Southern Pacific of Mexico in February, 1909. He became resident engineer on construction on the Illinois Central in March, 1911, and was promoted to roadmaster in June of the same year. He was promoted to district engineer of the Southern lines of the Illinois Central in August, 1913, and in November, 1916, he was made engineer maintenance of way of the Central of Georgia, which position he was holding at the time of his recent promotion.

C. E. Weaver

Mr. Lawrence was born on May 19, 1856, at Washington, Pa., and was educated at the Western University of Pennsylvania. He entered railway service in 1876 on the construction of the Allegheny Valley where he served as rodman and assistant engineer. From 1878 to 1880 he was assistant engineer on construction on the Erie, and from 1880 to 1887 he was successively assistant supervisor, supervisor and division engineer of maintenance of way on the Pennsylvania. He became engineer maintenance of way of the St. Paul, Minneapolis & Manitoba (now a part of the Great Northern) in 1887, and from 1889 to 1891 was chief engineer and general superintendent of the Eastern Railroad of Minnesota, which is now a part of the Great Northern. Mr. Lawrence was out of railway service from 1891 to 1899. From 1897 to 1899 he was assistant chief engineer of the Carnegie Steel Company, becoming engineer of construction of the Central of Georgia in the latter year. He became engineer on the electric zone of the New York Central in 1904, returning to the Central of Georgia in 1906, as chief engineer which position he was holding at the time of his recent retirement.

M. V. Holmes, roadmaster on the Atchison, Topeka & Santa Fe, with headquarters at Ottawa, Kan., has been promoted to division engineer, with headquarters at Marceline, Mo., succeeding **Irving Anderson,** transferred to Kansas City, Mo., where a new division engineer's office has been established. Mr. Holmes was born on August 20, 1887, at Wymore, Neb., and graduated from the University of Kansas in 1914. He entered railroad service in 1909 as a chainman on the Atchison, Topeka & Santa Fe, and was successively rodman and transitman until 1916, when he was promoted to office engineer for the division engineer, in which capacity he served until October, 1922, with the exception of the period from May, 1917, to July, 1919, when he was in the army. He served overseas with engineer regiments from September, 1917, to July 1919, as first lieutenant and captain. He was promoted to roadmaster, with headquarters at Ottawa, Kan., in October, 1922, which position he was holding at the time of his recent promotion.

Track

R. W. Putnam has been appointed roadmaster on the Southern Pacific, with headquarters at Eugene, Ore., succeeding **C. H. Neal,** who has been transferred to Oakridge, Ore., as roadmaster of the Oakridge branch from Mohawk Junction to Railhead, a newly established district.

Arthur C. Palmer has been appointed assistant supervisor on the Reading, with headquarters at Philadelphia, Pa., succeeding **Harold K. Modery,** who has been transferred with the same headquarters, to succeed **James F. Sherron, Jr.,** whose promotion to acting supervisor was noted in the May issue.

H. F. Varrlow, extra gang foreman on the Grand Trunk Western, at Imlay City, Mich., has been promoted to acting roadmaster, with headquarters at Durand, Mich., to succeed **F. Tranzow,** who has been promoted to acting superintendent of track, relieving **J. H. Regan,** who has been granted a leave of absence on account of injuries.

A. W. Bahr has been appointed roadmaster on the Chicago, Milwaukee & St. Paul, with headquarters at Austin, Minn., succeeding **J. S. Healy,** who replaces **W. Walsh,** with the same headquarters, Mr. Walsh having been transferred to the Twin City terminals, with headquarters at Minneapolis, Minn., in place of **F. Larson,** who has been granted a leave of absence. **W. T. McNamara** has been appointed roadmaster, with headquarters at Milwaukee, Wis., to succeed **D. Mau,** who has been assigned to other duties, and **C. F. Ogden** has been appointed roadmaster, with headquarters at Horicon, Wis., in place of

W. H. Armstrong, who has been transferred to the terminals at Milwaukee, succeeding **J. J. Van Bockern,** who has been transferred to Horicon, Wis., to replace **J. H. Johns,** who in turn has been transferred to Tama, Iowa, to succeed **M. Murphy,** deceased. **A. H. Hobart,** roadmaster, with headquarters at Elgin, Ill., has been transferred to Milbank, S. D., succeeding **W. A. Moberly,** who has been transferred to Elgin, Ill., in place of Mr. Hobart.

R. H. Holm, division engineer on the Missouri Pacific, with headquarters at Illmo, Mo., on account of ill-health, has been appointed roadmaster, with the same headquarters, succeeding **L. A. Baucom,** who has been transferred to Bush, Ill., where he replaced **M. Lundsford,** the latter having been transferred to Wynne, Ark., to succeed **I. C. Ellison,** who has been transferred to McGehee, Ark., in place of **W. F. Murray,** whose promotion to assistant division engineer, with headquarters at Hoisington, Kan., was noted in the June issue.

G. H. Warfel, roadmaster on the Union Pacific, with headquarters at Fremont, Neb., has been promoted to general roadmaster of the Kansas division with headquarters at Kansas City, Mo., succeeding **A. Jung,** resigned. **E. Bennetsen,** roadmaster, with headquarters at Grand Island, Neb., has been transferred to Fremont to replace Mr. Warfel, and **J. Foreman,** roadmaster with headquarters at Columbus, Neb., has been transferred to Grand Island to succeed Mr. Bennetsen. **W. L. Clifton** has been appointed roadmaster with headquarters at Columbus, Neb., to succeed Mr. Foreman.

C. J. Carney, assistant roadmaster on the Illinois Central, with headquarters at Louisville, Ky., has been promoted to acting roadmaster, with headquarters at Baton Rouge, La., succeeding **E. W. Brown,** who is on leave of absence on account of illness. **C. I. Van Arsdalen,** assistant engineer, with headquarters at Carbondale, Ill., has been promoted to supervisor, with the same headquarters, succeeding **C. E. Mifflin,** who has been assigned to other duties. **J. H. Blackburn** has been appointed supervisor on the Gulf & Ship Island lines, with headquarters at Mendenhall, Miss., succeeding **S. F. Thompson,** who has been assigned to other duties.

R. S. Collins, section foreman on the Atchison, Topeka & Santa Fe, has been appointed acting roadmaster, with headquarters at Ottawa, Kan., to succeed **J. H. Gidney,** roadmaster, who has been transferred with the same headquarters, to succeed **M. V. Holmes,** whose promotion to division engineer is noted elsewhere in this issue. **R. L. Grubb,** extra gang foreman, has been promoted to acting roadmaster, with headquarters at Abilene, Kan. Mr. Grubb was born on February 14, 1892, at Rose Hill, Va., and entered railroad service as a section laborer on the Louisville & Nashville in 1907 during the school vacation. After leaving school he worked as a section and extra gang laborer on the same road until 1912 when he was made an apprentice foreman, in which position he continued until 1915. He was out of railroad service from 1915 to April 15, 1919, on which date he entered the service of the Atchison, Topeka & Santa Fe as an assistant extra gang foreman. He was promoted to section foreman on September 16, 1919, and served in that capacity and as extra gang foreman until his recent promotion.

C. Armstrong, track supervisor on the New York, New Haven & Hartford, with headquarters at Franklin, Mass., has been transferred to New Haven, Conn., succeeding **G. W. Morrow,** whose resignation to become associated with the Ingersoll-Rand Company, with headquarters at Chicago, was noted in the June issue. **D. Maconi,** track supervisor, with headquarters at Putnam, Conn., succeeded Mr. Armstrong at Franklin and was in turn succeeded by **E. O. Carlson,** who has been track supervisor at South Braintree, Mass. **C. S. Flandreaux,** track supervisor, with headquarters at Providence, R. I., has been transferred to South Braintree to replace Mr. Carlson. **H. A. Pellett,** track supervisor on the Central New England with headquarters at West Winsted, Conn., has been appointed track supervisor on the New Haven, with headquarters at Providence, R. I., to replace Mr. Flandreaux. No successor to Mr. Pellett has been appointed on the Central New England as the supervisorship which he held has been abolished.

James A. McLeod, whose promotion to supervisor on the Illinois Central was noted in the June issue, was born in Chicago on June 11, 1875. He entered railway service on April 1, 1890, with the Erie as water boy in an extra gang. He was a track laborer in that road from April, 1902, until 1906, when he was promoted to section foreman at Hammond, Ind., resigning in the same year to become extra gang foreman on the Chicago & Alton, in which position he remained until 1909, when he returned to the Erie as general yard foreman at Buffalo, N. Y. He was promoted to supervisor in March, 1911, from which position he resigned in October, 1914, to become a roadmaster on the Great Northern. Ill-health caused him to resign this position and he later re-entered railway service as a supervisor on construction for the Belt Railway of Chicago, resigning on May 1, 1917, to become general foreman on the Illinois Central, which position he was holding at the time of his recent promotion.

Bridges and Buildings

A. D. Agnew, carpenter foreman on the Chesapeake & Ohio at Hinton, W. Va., has been promoted to supervisor of bridges and buildings, with headquarters at Ashland, Ky., succeeding **E. E. Bell,** resigned.

Water Service

F. M. Grantham has been appointed water supply foreman on the Chicago & North Western, with headquarters at Belle Plaine, Ia.

Guy E. Martin, whose promotion to supervisor of water service on the Gulf & Ship Island lines of the Illinois Central, with headquarters at Hattiesburg, Miss., was noted in the June issue, was born on December 9, 1898 at Princeton, Ky., and was educated at the University of Kentucky. He entered railway service on the Illinois Central as water service helper on March 30, 1921, and was promoted to district water service repairman on August 1, 1922, which position he was holding at the time of his recent promotion.

Emmett A. Brannan, whose promotion to supervisor of water service on the Yazoo & Mississippi Valley, a subsidiary of the Illinois Central, was noted in the May issue, was born on November 9, 1896, at Memphis, Tenn. He entered railway service on the Yazoo & Mississippi Valley as a helper in the water service department and on January 1, 1915, was promoted to water service and motor car repairman. On May 6, 1917, he enlisted in the United States Marine Corps, in which he served until his discharge on September 10, 1919, when he re-entered the service of the Yazoo & Mississippi Valley as a water service repairman. In November, 1920, he entered the service of the United States as chief engineer on the Kestrel II, in coast service in the West Indies, in which capacity he continued until June, 1921, when he again entered the service of the Yazoo & Mississippi as water service repairman. In September, 1922, he was promoted to inspector of water service with headquarters at Chicago, being transferred to Memphis in April, 1925, which position he was holding at the time of his recent promotion.

Purchasing and Stores

R. E. Mathis has been appointed general storekeeper of the Missouri & North Arkansas to succeed **L. Frost,** who has resigned.

J. E. Wharton has been appointed storekeeper, and **W. H. Brant,** assistant storekeeper, of the newly organized maintenance of way storehouse of the Western region of the Pennsylvania, with headquarters at Logansport, Ind., fol-

lowing the closing of the maintenance of way storehouse at Chicago and Indianapolis, Ind.

K. P. Chinn has been appointed assistant general storekeeper of the Southern Pacific Lines in Texas and Louisiana, with headquarters at Houston, Tex.

A. C. Simmons, who has been acting purchasing agent of the Chicago Great Western, with headquarters at Chicago, has been appointed purchasing agent.

E. V. James and **T. C. Sydnor** have been appointed storekeepers on the Chesapeake & Ohio, with headquarters at Charlotteville, Va., and Ronceverte, W. Va., respectively.

J. W. Cain, manager of the Consolidated Purchasing Agency of the American Short Line Railroad Association, has had his headquarters, together with those of the agency, moved from Chicago to Houston, Texas.

G. W. Leigh, general storekeeper of the Minneapolis, St. Paul & Sault Ste. Marie, with headquarters at Minneapolis, Minn., has been promoted to assistant purchasing agent and general storekeeper, with the same headquarters, a newly created position.

T. J. Frier, purchasing agent of the Wabash, with headquarters at St. Louis, Mo., has been appointed also purchasing agent of the Ann Arbor and the Manistique & Lake Superior, with the same headquarters, succeeding **C. Z. Hughes.**

Obituary

M. Murphy, roadmaster on the Chicago, Milwaukee & St. Paul, with headquarters at Tama, Iowa, died on June 16.

S. D. Cooper, assistant manager of treating plants of the Atchison, Topeka & Santa Fe, died at Topeka, Kan., on June 9. He was born on March 25, 1859, at Newcastle-on-Tyne, Northumberland, Eng., and came to the United States in 1895, entering railway service the same year as auditor of freight receipts of the Atchison, Topeka & Santa Fe at Topeka, Kan. In 1897 he was transferred to the store department, with the same headquarters, where he served successively as clerk, bookkeeper, and assistant store accountant. In 1904 he was appointed chief clerk to the manager of treating plants in the tie and timber department at Topeka, in 1914 chief inspector, and in 1920 assistant manager of treating plants, which position he was holding at the time of his death. Mr. Cooper was secretary-treasurer of the American Wood Preservers' Association in 1922, second vice-president in 1923, first vice-president in 1924, and president of the Association in 1925. He also served as vice-chairman of the Wood Preservation Committee of the American Railway Engineering Association in 1923 and as chairman from 1924 to the time of his death.

S. D. Cooper

William A. Archer, retired supervisor of water service on the Atchison, Topeka & Santa Fe, died at Detroit, Mich., on May 11, following an operation. Mr. Archer was born in England on April 7, 1848, and after serving in the mercantile marine entered railway service in 1870 as a chainman on the South & Lincoln, being promoted successively to leveler, transitman and foreman on construction. He came to the United States in 1873 and entered the service of the Atchison, Topeka & Santa Fe in 1879 as a clerk at Topeka, Kan. He was transferred to the engineering department as a draftsman in 1881, being promoted to supervisor of buildings in 1887, and to supervisor of water service in 1900, which position he was holding at the time of his retirement in 1923 at the age of 75 years.

Jacob Floesch, president of Floesch & McGovern, and chief engineer of the Buffalo, Rochester & Pittsburgh from 1900 to 1907, died on May 20 at his home in Rochester, N. Y., at the age of 68 years. After resigning as chief engineer of the Buffalo, Rochester & Pittsburgh, Mr. Floesch was engaged in the construction of the Moncton branch of the Grand Trunk in Canada and later was connected with other railroad construction in the United States and Canada.

William G. Raymond, dean of the college of engineering of the University of Iowa and the author of a number of books on railway engineering, died in Iowa City, Iowa, on June 17, of pneumonia with complications affecting the heart. Dean Raymond was born at Clinton, Iowa, on March 2, 1859, and was educated at the University of Kansas, Washington University and the University of Michigan. He served as assistant engineer in location and construction of railways in the Mississippi Valley at various times during the period when he was receiving his education and later practiced as a general consulting engineer. He was appointed professor of civil engineering of the University of Iowa in 1904, and was made dean of the college of applied science a year later. Dean Raymond was the author of Plane Surveying, Elements of Railroad Engineering, Railroad Field Geometry and Railroad Field Manual for Civil Engineers. In recent years he was particularly concerned with railway valuation matters and was the author of a book on this subject, entitled What Is Fair and also The Public and Its Utilities. In 1918 and 1919 he was a member of the Iowa State Board of Conciliation, adjusting public utility rates during the war.

The Atchison, Topeka & Santa Fe has recently changed the organization of its engineering department on its Eastern lines so that division engineers who formerly were not charged with the responsibility for maintenance work, now have such work placed under their jurisdiction on their respective divisions. This practice has been followed on other lines of the system for some time.

About 200 employees of the maintenance of way department of the Middle division of the Atchison, Topeka & Santa Fe, accompanied by their families, met at Winfield, Kan., on June 12, for a combined business session and picnic in Island Park. The business meeting was presided over by N. Bridges, roadmaster, and while it was in progress the families of the men were taken on sight-seeing trip by the Winfield Chamber of Commerce. The only address of the day was made by H. A. Hobble, safety superintendent for the Eastern and Western divisions, with headquarters at Topeka, Kan. After the business session was ended the remainder of the day was devoted to games, athletic contests and dancing.

Revenue freight car loadings for the week ended May 15 amounted to 1,030,162 cars, making this the earliest week in any year to reach a total of a million cars. The two succeeding weeks each exceeded the million mark, amounting to 1,039,385 for the week ended May 22, and to 1,081,164 for the week ended May 29, all of these figures showing substantial increases over the corresponding periods in 1925 and 1924. For the week ended June 5, which included the Memorial Day holiday, the total was 945,964, a decrease of 52,279 as compared with the corresponding week in 1925, but an increase of 35,171 as compared with 1924. The holiday was not included in the corresponding weeks of 1925 and 1924. The cumulative total for the first 24 weeks of this year amounts to 22,930,492 compared with 22,350,734 and 21,373,355 for the corresponding periods in 1925 and 1924, respectively.

Construction News

The Atchison, Topeka & Santa Fe and the Kansas Highway Commission have agreed upon plans for the elimination of a grade crossing by the construction of a subway at Wellington, Kan. A contract has been awarded by the Dodge City & Cimmaron Valley, a subsidiary of the Santa Fe, to the Cook & O'Brien Construction Company, for an extension from Manter, Kan., to Joycoy, Colo., a distance of 56 miles. A sub-contract has been awarded to Jerome A. Moss, Chicago, for all buildings and water stations on the line.

The Atlantic Coast Line has authorized work aggregating a total cost of $5,496,000 as follows: Construction of passing tracks and sidings, $1,685,000; stations and station facilities, $354,000; signals and interlocking plants, $159,000; metal bridge reconstruction, $292,000; station house and other roadway facilities, $26,000; water stations, $75,000; telephone and telegraph facilities, $110,000; storehouse facilities, $32,000; improvements to mechanical facilities, $2,706,000; equipment, $57,000. A contract has been awarded to Dwight P. Robinson & Co., for the construction of an office building at Savannah, Ga. Work will begin immediately. A contract has been awarded to the Roberts & Schaefer Company, Chicago, for the construction of three 500-ton, three-track, reinforced concrete locomotive coaling stations at St. Petersburg, Fla., Wilcox Junction and High Springs. An order has also been placed with the Roberts & Schaefer Co., for two electric cinder plants for installation at St. Petersburg, Fla., and Palatka.

The Interstate Commerce Commission has authorized a change in route for this company's Thonotosassa (Fla.) to Dade City line, which was authorized in March. The change shifts the line eastward 4 miles to serve Zephyrhills and it will join the road's west coast line at Richland, 7 miles south of Dade City, continuing along this route to Dade City. The change in route will make the new line 22.5 miles long as compared to 21 by the old route.

The Baltimore & Ohio has awarded a contract to the Baltimore Heat Corporation, Baltimore, Md., for installing heating facilities in the company's new fruit auction house at Philadelphia, at an estimated cost of $34,000, and one to J. R. Livezey, Baltimore, Md., for cork insulation and refrigerator doors for the same structure at an approximate cost of $100,000. A contract has been awarded to the Vang Construction Company, Cumberland, Md., for bridge and channel changes at Dock Siding, Ill., at an estimated cost of $45,000. Pursuant to the removal of the locomotive terminal facilities at Garrett, Ind., to Willard, Ohio, extensive changes are being made in the engine house shops at the latter point. Ten engine stalls will be lengthened and a larger turntable will be installed.

The Bangor & Aroostook has authorized the retirement of an old bridge at Millinocket, Me., and its replacement by a new deck-girder structure of E-60 capacity; also raising the grade 6 ft. to remove a sag at a total cost of approximately $49,000. Fabrication of the bridge will be performed by the American Bridge Company and the remainder of the work by company forces.

The Boston & Albany has awarded a contract to the J. F. Fitzgerald Construction Company, Boston, Mass., for alterations to Bridge 73.08 and Bridge 73.17, at Warren, Mass.

The Boston & Maine has authorized the construction of a $43,000 restaurant building at Billerica, Mass., and a contract for a portion of the work, to cost approximately $26,000, has been awarded to the Edwards & Monahan Company, Lowell, Mass.

The Central of Georgia has awarded a contract to the Artley Company, Savannah, Ga., for the construction of an addition to the roundhouse at Savannah, to cost approximately $100,000. The company has awarded a contract to the Peerless Plumbing & Heating Company, Savannah, for the installation of plumbing and heating in the hospital at Savannah. It has also awarded a contract for electric wiring for the hospital to the Byck Electric Company, Savannah. The total cost is estimated at $57,000. A contract has been awarded to Fairbanks, Morse & Co., Chicago, Ill., for the construction of a reinforced concrete coaling station at Raymond, Ga., to cost approximately $36,000. The construction of a station at Fort Benning, Ga., is contemplated.

The Chesapeake & Ohio is receiving bids for the construction of a water treating plant at Raleigh, W. Va.

The Chicago & Alton has awarded a contract to the W. E. Clant Company, Cedar Rapids, Iowa, for the moving of the freight house at Bloomington, Ill., to a new site and the construction of concrete foundations for it on the new site. The freight house will be moved intact for a distance of several hundred feet. The building is a stone structure, 300 ft. long, weighing approximately 50,000 tons.

The Chicago & Eastern Illinois has awarded a contract to the Roberts & Schaefer Company, Chicago, for the construction of a five-track, reinforced concrete electric coaling station of 600 tons capacity at a point near Watseka, Ill. Bids are being taken for the construction of an engine terminal at Evansville, Ind., including a 16-stall roundhouse, a power house, a machine shop and a storehouse.

The Chicago Great Western has awarded a contract to the T. S. Leake Construction Company, Chicago, for the construction of a station at Villa Park, Ill.

The Chicago & North Western has been authorized by the Interstate Commerce Commission to construct a line from a connection with its Wisconsin division at Wiscona to a point on its Lake Shore division north of Whitefish Bay, Wis., a distance of three miles. Permission was also given to abandon that portion of the Lake Shore division from Shorewood to a point north of Whitefish Bay, approximately four miles in length. The authority to construct was granted on the condition that the work shall commence on or before July and be completed on or before December 31, 1929. The line to be abandoned must be kept in operation until completion of the construction. This company has awarded a contract to the Chicago Bridge & Iron Company for the construction of five water treating plants as follows: Salem, 50,000-gal. capacity, Marshalltown, Iowa, 75,000-gal. capacity, Fremont, Neb., 125,000-gal. capacity, Nelson, Ill., 150,000-gal. capacity and Huron, S. D., 50,000-gal. capacity, and for treating plants ranging from 12,500 to 35,000 gallons per hour capacity, at Chadron, Neb., New Ulm, Minn., South Pekin Ill., and New Butler, Wis. Bids are being taken for the construction of a water station and pipe lines at New Ulm, Minn. Bids are also being taken for the construction of a 6-stall roundhouse addition at Fremont, Neb.

The Chicago & Western Indiana has given a contract to the McClintic-Marshall Company for 650 tons of structural steel for highway crossing work.

The Chicago, Rock Island & Pacific has been authorized by the Interstate Commerce Commission to construct an extension from a connection with its line at Clark's Grove, Minn., easterly through Hollandale to Maple Island, a distance of approximately 10 miles. In connection with the same project the receivers of the Chicago, Milwaukee & St. Paul have been authorized to build an extension from a connection with its Southern Minnesota division to a connection with the projected line of the Rock Island at a point east of Hollandale. The Milwaukee desired also to construct a branch from a point near Hollandale to Maple Island, but the commission provided instead that the Rock Island should grant trackage rights to the Milwaukee between these points. The construction of an extension from Billings, Okla., to Ponca City will be completed by the end of the year. A contract has been awarded to the T. S. Leake Construction Company, Chicago, for the construction of a 20-stall roundhouse at Burr Oak, Ill., and plans are being prepared for a one-story shop building at the same point. Contracts have been awarded to the Roberts & Schaefer Co., Chicago, for a three-track electric

cinder plant at 47th street, Chicago, and for an electric cinder plant at Manly, Iowa. Fairbanks, Morse & Co. have been awarded a contract for a coaling station at Council Bluffs, Iowa.

The Cleveland, Cincinnati, Chicago & St. Louis will soon receive bids for the construction of an engine terminal and shops at Riverside, Ohio, near Cincinnati, reported in the May issue.

The Gulf Coast Lines are receiving new bids for the construction of a passenger station at Brownsville, Tex., the old plans upon which bids were asked having been revised.

The Illinois Central has awarded contracts for the construction of three water stations on the new line between Edgewood, Ill., and Fulton, Ky., as follows: to the W. J. Zitterel Company, Webster City, Iowa, for a water station at Bluford, Ill.; to the Bates & Rogers Construction Co., Chicago, for a water station at Edgewood; and to the Railroad Water & Coal Handling Co., Chicago, for a water station at Xenia. Bids are being received for the construction of a water station at Fancy Farm, Ky.

The Kansas City Terminal is preparing plans for the construction of a reinforced concrete and steel viaduct over the railroad tracks at Oak street in Kansas City, Mo., at a cost of $350,000.

The Louisville & Nashville has awarded a contract to the Summer Construction Company, Nashville, Tenn., for the construction of a brick and concrete passenger station at McKenzie, Tenn., to cost approximately $20,000.

The Louisville, Henderson & St. Louis is preparing plans for the replacing of the steel draw span bridge over the Green river at Spottsville, Ky., and the raising of the present piers and abutments, at a cost of $50,000.

The Maine Central has authorized the installation of a new wheel shop, blacksmith shop and passenger car repair track at Rigby, Me., and the transfer of machinery and tools to that place from Thompson's Point, Me. The project will cost approximately $72,000. It has also authorized the replacement of the old wheel shop and wash room building by a new shop, and the installation of new and second-hand machinery and a new transfer table at Waterville, Me., to cost approximately $83,000.

The Minneapolis, Northfield & Southern has been authorized by the Interstate Commerce Commission to construct an extension from Golden Valley, Minn., to a connection with the Minneapolis, St. Paul & Sault Ste. Marie at Crystal, a distance of six miles, at an estimated cost of $350,000.

The Minnesota Western has awarded a contract to Lobnitz & Davy, Olivia, Minn., for the construction of an extension from Lake Lillian, Minn., to Montevideo, a distance of approximately 50 miles.

The Missouri-Kansas-Texas and the Kansas Highway Commission have agreed upon plans for the construction of a subway at Chetopa, Kan.

The Missouri Pacific has sold the lease on four floors of the Railway Exchange, St. Louis, Mo., occupied by its general headquarters and the construction of a 15-story office building is contemplated. The present offices in the Railway Exchange will be vacated within 18 months. A contract has been awarded to the Virginia Bridge & Iron Company for the construction of a bridge at Kragen, Ark., to cost approximately $63,000. A repair shop will be constructed at Hot Springs, Ark., and other improvements will be made at this point including the construction of two heating plants, the erection of two train sheds long enough to accommodate trains of 18 and 19 cars, the erection of a 50,000-gal. water tank and the installation of a large cinder conveyor. The passenger station will be remodeled also. The improvements at Hot Springs are expected to cost approximately $200,000.

The Morris & Essex which is leased by the Delaware, Lackawanna & Western, has applied to the Interstate Commerce Commission for authority to build a four-track extension of 0.676 miles to connect with a new freight yard at Jersey City, N. J.

The New York Central has awarded a contract to the P. T. Cox Contracting Company, Inc., New York City, for the construction of the north abutment, including wing wall at W. 137th street, New York City, to cost approximately $95,000. A contract has been awarded to the Morgan Engineering Company, New York City, for the manufacture, delivery and erection of a 20-ton electric traveling crane at Rochester, N. Y., to cost approximately $33,500. A contract has also been awarded to the Walsh Construction Company, Davenport, Ia., for grading for third track from Voorheesville, N. Y., to South Schenectady, N. Y., to cost approximately $975,000.

The New York, New Haven & Hartford has authorized the construction, by company forces, of a 34 ft. extension of nine stalls in the present engine house at Cedar Hill, New Haven, Conn., to accommodate heavy power. The approximate cost is $80,000. This supersedes previous information reported in the June issue that a 10-stall extension would be constructed, to cost approximately $97,000.

The Northern Pacific will construct freight handling facilities at Spokane, Wash., as part of the development of a new industrial site in that city. The buildings will include a 67-ft. by 80-ft. office building; a 67-ft. by 280-ft. inbound freight house and an 18-ft. by 700-ft. covered platform for outbound freight. The construction of a bridge over the Mississippi River at Eighteenth avenue, Minneapolis, Minn., at a cost of $350,000, is expected to start next month. A contract has been awarded to the Industrial Contracting Company, Minneapolis, Minn., for the construction of approximately four miles of track, three reinforced concrete and steel viaducts and for approximately 75,000 cu. yd. of excavation in connection with grade separation work in the northeastern part of Minneapolis, estimated to cost approximately $100,000.

The Pacific Great Eastern has awarded a contract to the Georgia Construction Company, Vancouver, B. C., for realinement work north of Lillooet, B. C., involving the removal of 342,000 yards of earth. The realinement will shorten the line and eliminate the highest wooden bridge on the railway.

The Pennsylvania has awarded a contract to E. H. Dobson, Pittsburgh, Pa., for the reconstruction of bridge 13.6 and for building an extension to bridge 13.7 at Smith's Ferry, Pa., to cost approximately $25,000. This company has also awarded a contract to the Atlantic Elevator Company, Philadelphia, Pa., for the installation of one electric elevator and six electric platform lifts at the new American Railway Express Company building at the Sunnyside Yard, Long Island City, N. Y., to cost approximately $25,000. A contract has been awarded to Fischbach & Moore, Inc., New York, for electrical work in connection with the same building to cost approximately $62,000. A contract has been awarded to the W. F. Trimble & Sons Company, Pittsburgh, Pa., for remodeling the present railroad bridge over Beaver river, Beaver Falls, Pa., for use as a highway bridge between New Brighton, Pa., and Beaver Falls, Pa., to cost approximately $75,000. A contract has been awarded to the H. E. Culbertson Company, Cleveland, Ohio, for the construction of a new freight house at Woodland avenue, Cleveland, Ohio, to cost approximately $50,000. A contract has been awarded to the Herrick-Whipple Construction Company, Erie, Pa., for masonry for the subway at 12th street, Erie, Pa.

The Southern Pacific, together with the Union Pacific, the Atchison, Topeka & Santa Fe and the Pacific Electric, will be granted a hearing by the California Railroad Commission on August 2, to show why they should not join in the construction of a union station at Los Angeles.

The St. Louis, Troy & Eastern has been authorized by the Interstate Commerce Commission to construct an extension in the form of an elevated structure to the eastern end of the McKinley Bridge in Venice, Ill., 1.53 miles, at an estimated cost of $863,000.

Supply Trade News

General

The Mixwax Company, Inc., has moved its office from 10 East Huron street to 230 East Ohio street, Chicago.

The American Steel Foundries, Chicago, has removed its St. Louis, Mo., offices from 729 Frisco building to 1717 Railway Exchange building.

The West Disinfecting Company has removed its executive, sales, purchasing and advertising departments from 411 Fifth avenue, New York, to its new building at Barn street, near Bridge Plaza, Long Island City, N. Y.

The Sullivan Machinery Company has removed its northwestern sales office at Spokane, Wash., from the Hutton building to 120 South Lincoln street. This company plans the construction of a two-story plant, 50 ft. by 260 ft., at Chicago.

The Osgood Company, Marion, Ohio, having purchased from the receiver the good will and all of the patterns, records, drawings and materials on hand of the Fairbanks Steam Shovel Company, Marion, Ohio, is prepared to furnish repair parts for the latter company's machinery and equipment. Charles Melvin, who was for many years connected with the Fairbanks Steam Shovel Company has been placed by the Osgood Company in charge of the department for handling service and repair parts for Fairbanks equipment.

The Armco Culvert & Flume Manufacturers Association is celebrating this year the 30th anniversary of the invention of the corrugated culvert. A feature of the celebration is the display of the Association's research laboratory at Middletown, Ohio, of the first corrugated culvert ever made. This culvert was manufactured by the inventor, James H. Watson, and was placed early in 1896, under a public highway near Crawfordsville, Ind., from which location it was recently removed for exhibition purposes. It is one of many similar culverts still in service near Crawfordsville, and it is considered significant that the original design has remained unchanged.

Personal

D. A. Corey, vice-president of S. F. Bowser & Co., Inc., Ft. Wayne, Ind., has resigned.

H. C. McClary, vice-president of Fairbanks, Morse & Co., from 1907 to 1917, died at Evanston, Ill., on May 30.

C. W. Pank, who resigned as vice-president of Fairbanks, Morse & Co., in January, 1924, died on June 21 at Evanston, Ill.

L. G. Plant has been appointed sales agent for the Ogle Construction Company, Chicago, in addition to his duties as general sales agent for the Locomotive Terminal Improvement Company.

Lawrence A. Luther, maintainer of motor cars and tie tampers on the Delaware, Lackawanna & Western, has become associated with the Ingersoll-Rand Company, with headquarters at Chicago, and will look after the servicing of Ingersoll-Rand pneumatic tie tamper equipment on railroads of the mid-west territory.

A. Milton Buck has joined the sales force of the Bridgeport Brass Company, Bridgeport, Conn. Mr. Buck will have his headquarters at Washington, D. C., and his territory will include Washington, D. C., the states of Maryland, Virginia and West Virginia. He will specialize on sales of Bridgeport Keating flush valves and Plumrite brass pipe.

Francis T. West, who has been western manager for the Watson-Stillman Company, with headquarters at Chicago for the past 25 years, has retired and has been succeeded by **J. F. Coyne,** with offices at 549 West Washington boulevard, Chicago. **James T. Lee** and **John O. Clark** will be associated with Mr. Coyne in the handling of the hydraulic machinery and accessory lines of the Watson-Stillman Company.

Robert B. Jennings, formerly division engineer of the Canadian National, with headquarters at Montreal, Que., has been appointed general manager of the Robert W. Hunt Company, Ltd., with headquarters at Montreal.

Trade Publications

Sand and Gravel Buckets. Under the title "Handling Sand and Gravel with Hayward Buckets," a new bulletin, No. 627, has been issued recently by the Hayward Company, New York, which fully describes and illustrates the complete line of buckets manufactured by this company, and more particularly the application of these buckets to the various common and special types of hoisting equipment used in the mining and handling of sand and gravel.

Improved O. G. Fir Gutters.—E. M. Long & Sons, Cadiz, Ohio, have recently issued a 16-page booklet describing and illustrating their Improved O. G. Fir Gutters for building construction, setting forth the advantages of these gutters, from the standpoints of both durability and architectural appearance. Illustrations for railroad and other buildings are shown, as well as diagrams of methods of installation.

The Inundation System.—The Blaw-Knox Company, Pittsburgh, Pa., has issued a revised second edition of its "Inundation Book" explaining the principle of inundating sand as a means of eliminating the bulking effect in obtaining accurate proportions in concrete. It also describes the Blaw-Knox inundator, which is a mechanical contrivance for carrying on the process of inundation in a practical way in the mechanical proportioning and mixing of concrete. The subject matter is presented in an elementary way that is readily understood and illustrations are freely used to make the matter clear.

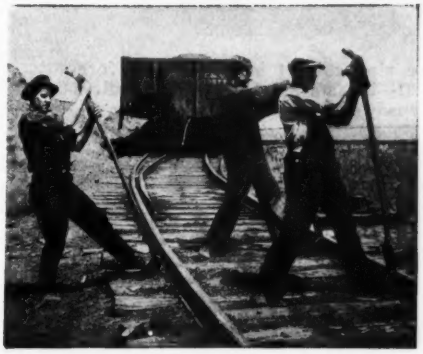
Better Water Service for Coach Yards, Train Sheds and Cinder Pits.—A 20-page booklet has been issued by the Murdock Manufacturing & Supply Company, describing and illustrating its water service boxes for railway use. It calls attention to their advantages from the standpoints of cleanliness, saving of water, safety, freedom from maintenance expense and long service life. The various details of the boxes and valves are shown and useful hints are given for their installation.

Sullivan Belt-Driven Air Compressors. The Sullivan Machinery Company has issued Bulletin No. 83-B, (Second Edition), a 15-page booklet containing complete descriptions of the Sullivan belt-driven, Wafer valve air compressors, Class "WG-6" single-stage and class "WH-6," double stage. The bulletin is fully illustrated with views of installations for various duties, together with sectional views of each type. A table showing dimensions and capacities of the various sizes of these compressors is also given.

Direct-Injection Oil Engines. A catalog dealing with this type of engine has recently been issued by the Ingersoll-Rand Company, New York. This catalog is devoted almost entirely to the Ingersoll-Rand type "PO" direct-injection engines which are of the horizontal, single stage, single acting direct-injection type operating on the four-stroke cycle. Every phase of these engines is described and illustrated in detail, outlining their advantages, construction and particular adaptability as power units in various classes of service.

Steel Cross Ties. The ninth edition of its steel cross tie catalog has recently been issued by the Carnegie Steel Company, Pittsburgh, Pa., in which are described and illustrated the many steel tie sections rolled by that company for various classes of service, and also the many types of clamps and fittings furnished for use with these ties. The catalog which contains 46 well-illustrated pages, is divided into three sections, dealing separately with mine ties, portable track ties and ties for steam and electric railroads.

BLOXHAM Track Liners



THREE men with Bloxham Track Liners easily do the work of eight to eleven men equipped with ordinary lining bars.

A 150-lb. pull on the Bloxham exerts 1800 lbs. pressure against the rail base. In competitive demonstration tests three section hands with Bloxham Liners moved 100 feet of main trunk line track one inch out of line and back again in 13 minutes—about half the time required by the nearest competitor. The same job required nine men equipped with ordinary lining bars.

Save time and labor with Bloxham Liners. A demonstration will be arranged at your convenience. Write for full information.

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Kedzie Ave. at 37th St., Chicago, Illinois

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Washington, D. C.

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Track Specialties Co., 29 Broadway, New York City

Hubbell & Sharp, 1712-1714
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BLOXHAM Track Liners

REM7-Gray

-THE SHOVEL WITH A BACKBONE-

The backbone that doubles the life of a shovel—a cost feature worth considering.

We have issued a booklet "Shovel Troubles Overcome" wherein we explain the "backbone" and its purpose.

There are four weaknesses in shovels, each of which has been corrected in the Zenith.

Write for a copy of the booklet—it is interesting.

Buyers' Guide

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GREATER POWER—MORE SPEED

FOR highspeed, heavy duty maintenance of way work this special oil burning INDUSTRIAL locomotive crane equipped with power shovel boom and dipper, has no equal.

Having a propelling speed of fifteen miles an hour it is able to move from place to place quickly. Equipped with oil burning device, the pressure of steam is always constant, enabling the operator to work at maximum capacity at all times without the necessity of replenishing his fire with the resulting temporary decrease in steam pressure. This is an important feature in maintenance of way work as there is no necessity for delay.

Equipped with shovel boom and dipper, this machine is a full fledged steam shovel, being used to clean landslides, prepare road beds, dig ditches and everything expected of a shovel. Equipped with a crane boom, it is an all purpose locomotive crane, being able to operate clamshell buckets, electro magnets, hook and block and pile driver leaders. This INDUSTRIAL is an all purpose, high speed, heavy duty maintenance of way crane. It is economical of fuel, sturdy in construction, correct in design and efficient in operation.

Write for the new bulletin describing Industrial Maintenance of Way Cranes

INDUSTRIAL WORKS --- BAY CITY, MICH.

INDUSTRIAL

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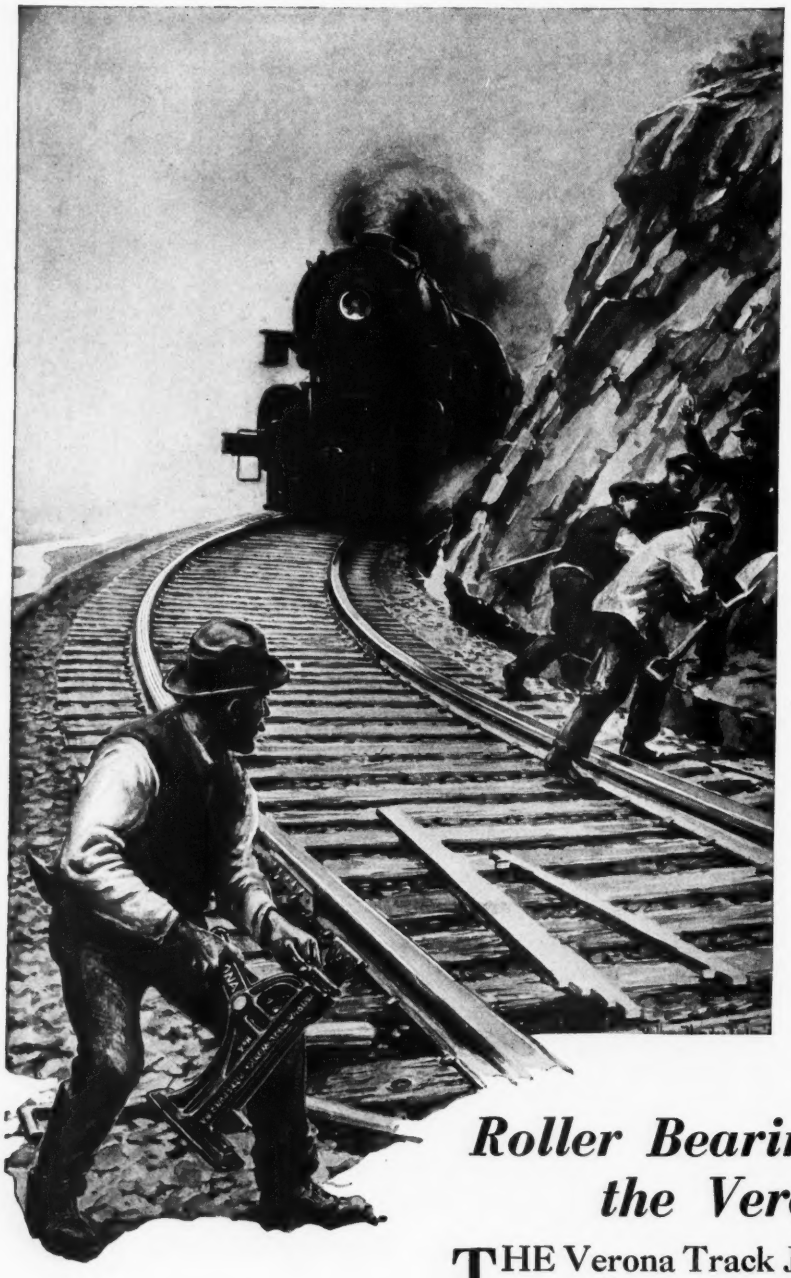

Roller Bearings now speed the Verona Jack

THE Verona Track Jack is now equipped with two roller bearings.

These bearings take the thrust of the rack bar against the frame. As a result, they make lifting easier, speed the already instantaneous trip, and materially increase the safety and usefulness of the jack.

The trip is set when the track is lifted. A blow on the lever socket with a lining bar trips the jack instantaneously. Even in the event of short flagging, the smooth, sure, easy action of this new jack is an assurance of safety.

Five sizes
Single and double acting
Lifting range 6 to 18 in.
All actual 15-ton capacity
All roller bearings

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